



FRIDAY, DEC. 20.

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Contributions.

The Uses of a Testing Department.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I agree fully with the stand taken in your editorial of Dec. 6, and, as you well know, have always been an advocate of laboratories, both chemical and physical. I notice, however, what you say about the practical training, etc., unfitting a person for laboratory work. There is, I think, a converse to this. The theoretical chemist or physicist on the other hand, may be unfitted for the best work in a chemical laboratory and may see more strongly the necessity of accuracy and exactness in his work than the needs of the road and the importance of time as a factor in handling supplies; for the laboratory is not a place for original research on a railroad, but a tool to aid the cheap, efficient and prompt despatch of the operation of the road. Some of the tests, it seems to me, are too cumbersome and long, and as a rule the laboratory man is, I think, not quite willing enough to accept the results of makeshift tests in cases where promptness in getting the material into use was an object.

I noticed, for instance, once when I was trying to start a laboratory, and making tests of material with such facilities as the ordinary machine shop afforded, that we were able to make fairly accurate tests, which clearly proved the fitness or unfitness of various goods in a short time. I recently gave a scientific and careful experimenter an account of some of our methods, and he was very much exercised over the crudeness of our tests, and thought they could not amount to much. I did not pretend that they were scientifically accurate, but they gave us what we wanted with the least delay to the material. I think the above may give you a text for something like this: "Common sense and a knowledge of practical railroad affairs are important for the laboratory man, so that he can decide promptly how far to occupy time in making the individual tests."

S. N.

Driver Brakes on Suburban Engines.

NEW YORK, December 16, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your article in last week's issue of the *Railroad Gazette* on "Suburban Locomotives" calls attention to a much-needed reform. It is only too true that many railroads having a suburban traffic have fallen into the bad practice of using old and decrepit rolling stock—both engines and cars—in this service. This is a great discomfort to their patrons and a pecuniary loss to their shareholders. The time spent daily upon these trains by each individual is short, but that is no reason why he should be subjected to all the casualties occurring to a dingy and rickety old car, drawn by an engine that has seen its best days on main-line expresses.

The Chicago, Burlington & Quincy is to be thanked for devoting so much attention to this kind of traffic as to design an engine especially for it; and as the officers of this road who have had this work in hand are eminently capable men, there is a greater reason to expect that what they have produced will be followed more or less closely by other railroads having the same class of traffic.

In the several illustrations of this engine which you publish, I notice that it is supplied with a "squeeze" brake (two shoes to a wheel). This is another instance of the careful forethought that has been brought to bear upon the requirements of modern traffic. Many engines are now running upon suburban trains without any brakes at all upon them. If I were to say, "This is an outrage upon the traveling public," I don't know that my language would be any too strong. As you put it, these trains are usually short, and it is, or ought to be, well known that a full-powered steam-driver brake upon

all the wheels of an engine is perfectly capable of handling one of these trains alone and unaided by train brakes, and may be relied upon to stop the whole train should the air brakes fail. Just why the designers of this brake should have made it an air brake and not a steam brake I am at a loss to understand. Why should the engineer, the passengers and the railroad company be deprived of the additional factor of safety that a steam driver brake gives? Why must the steam be sent through an air pump before its power is felt in the brake cylinder? It can be applied by the same lever and simultaneously with the train brake. It is far more powerful and more sure when sent direct from the boiler, and it is there always ready as long as there is steam in the boiler; while, on the other hand, let anything go wrong with the air pump and all the brakes are useless.

It will doubtless gratify the gentlemen of the Driver Brake Committee of the last Master Mechanics' Convention to see that their recommendations have been heeded and adopted by the officers of such a road as the Chicago, Burlington & Quincy, but that these gentlemen should have taken advantage of the superior stopping abilities of the "squeeze" brake is not to be wondered at when we recall the fact that the experiments which proved that a "squeeze" brake upon an engine was 45 per cent. more effective than either a "spread" or a "pull" brake were made by the officers of the C. B. & Q. on their own road, in the brake tests two years ago, and I have wondered much that they have not long before this applied the squeeze brake to all their locomotives. It may be that the reason is found in the brake you illustrate. It is evident that, notwithstanding the brake is built upon the true principle, and is an interlocked and equalized squeeze brake, yet it is applicable only to a limited class of engine. The use of brake beams and a centre line of floating levers and pull rods filling up the already limited space between the motion beneath an engine is too cumbersome, even if it were possible to apply it to other classes of engines, which it is not.

Another objection is the obliquity of the pull rods, which cannot be well avoided in this style of brake; but there are squeeze brakes that are free from these objections and will go upon every class of engine. Why not use them? Notwithstanding these faults, however, the brake as applied to this engine is an immense improvement on either a "pull" or a "spread" brake, and I venture to predict that it will stop the engine from any speed in half the distance required by a "spread" or "pull" brake on the same class of engine.

There is one more point in reference to this brake. I am not aware what opinions are held by the designer as to the propriety of putting a brake upon an engine truck; the engine in this case has no truck and the leading wheels are a pair of the driving wheels, but they are covered by a squeeze brake and it may be presumed that the mechanical engineer who would do this would not hesitate to cover an engine truck with a brake. And I am glad to see that much evidence coming from the C. B. & Q.

JAS. HOWARD.

Some of the Problems Introduced with the Compound.

CHICAGO, Dec. 4, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

May there not be some serious difficulties in the adoption of the Worsdell-Von Borries system in this country? For example, will not such engines give trouble with steaming unless the exhaust nozzles are decreased to a point where much of the advantage gained from compounding would be forfeited? On the English railroads, and especially where the Worsdell compounds have been used, the grades are usually slight compared to those commonly used in this country, so that the maximum effort of the engine is there usually exerted at the starting; while in this country, except on the level lines, the maximum effort is used on the gradients. Mr. Ackworth's book on English railways speaks of the difficulty of maintaining steam on the Worsdell engines when climbing grades which are really slight compared to ours.

As our driving wheels are usually smaller than are commonly used in England, the effect of the counterweights would be for the same speeds generally greater than in England, although our track is probably, as a usual thing, not equal to the English. With the increased size of cylinders it would be a difficult matter, too, not to increase the weight of the reciprocating parts and hence the weight of the counterbalance.

Do not suppose from all this, however, that I am not sufficiently progressive to approve of the compound principle, but simply that I believe there will be more success with compounds on level than on hilly roads; and on the whole, it does seem to me that there is more room for economy in the fire box than in the cylinder.

Although I have, perforce, written this disconnectedly and hurriedly, it is a subject on which I am really very much interested, and on which I have spent considerable thought.

Rails are my hobby, of course, and you can understand my solicitude, therefore, in the matter of counterbalances. I have traced the curve of pressure on the driving wheels of locomotives counterbalanced according to the most approved American practice, and in most cases the centrifugal force of the counterbalance is sufficient at something like 75 miles per hour to ac-

tually lift off the drivers from the rails. Of course, no fault is ever found with the counterbalancing of the engine unless in actual trial it does damage track. It may all but raise the driving wheels off the rails at the other half of its revolution, nearly doubling the "supposed" load per driver, and nothing is said. N. O.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with a great deal of interest the various articles and editorials on the subject of locomotive counterbalancing which have appeared from time to time in the columns of the *Railroad Gazette*, and while I cannot agree with those who recommend doing away with counterweights altogether on two-cylinder engines, still it does seem that the value of a locomotive which would require no counterbalancing is so great as to deserve the careful attention of locomotive designers. The consideration of the problem can very appropriately be taken up in connection with the adoption of a compound locomotive, in the use of which, it is now generally admitted, we shall soon, in this country, begin to follow the example of our English cousins.

American locomotives carrying a static load of, say, 15,000 lbs. on each driving wheel are in actual fact, when running at speeds which they commonly attain, producing the effect of a load alternately greater and less than this amount in each complete revolution of the wheels, and which amounts to a maximum load of at least 25,000 lbs. on each driving wheel at high speeds. This excessive increase in load which track and bridges must withstand, on account of the vertical moment of the centrifugal force of the weights intended to counterbalance the reciprocating and revolving parts, requires that the roadbed and track be built to endure, with a marginal factor of safety, this maximum load of, say, 25,000 lbs. per driver, while, on the other hand, the efficiency of the engine depends on the static load.

To me this seems un-American. Our railroad development, in strong contrast to the English and Continental, has from the start followed the principle that the road itself should be built cheaply, and as the character of the country would best permit, while the cars and locomotives have been made to adapt themselves to the grades, curves and inequalities of the roadway. There is no question that track and bridges can be made strong enough to withstand the increase in load due to the counterbalance weights; but aside from the question of expediency, does this not seem very much like building the road for the locomotive, instead of the locomotive for the road, and with the same roadway could we not, but for the counterbalance, have a static load of 22,000 lbs. at least per driving wheel? A three-cylinder engine with cranks at 120 degrees would be practically self-counterbalancing, and would for that reason allow a static load per driving wheel one-third greater than is now carried, without proving any more destructive to track and bridges.

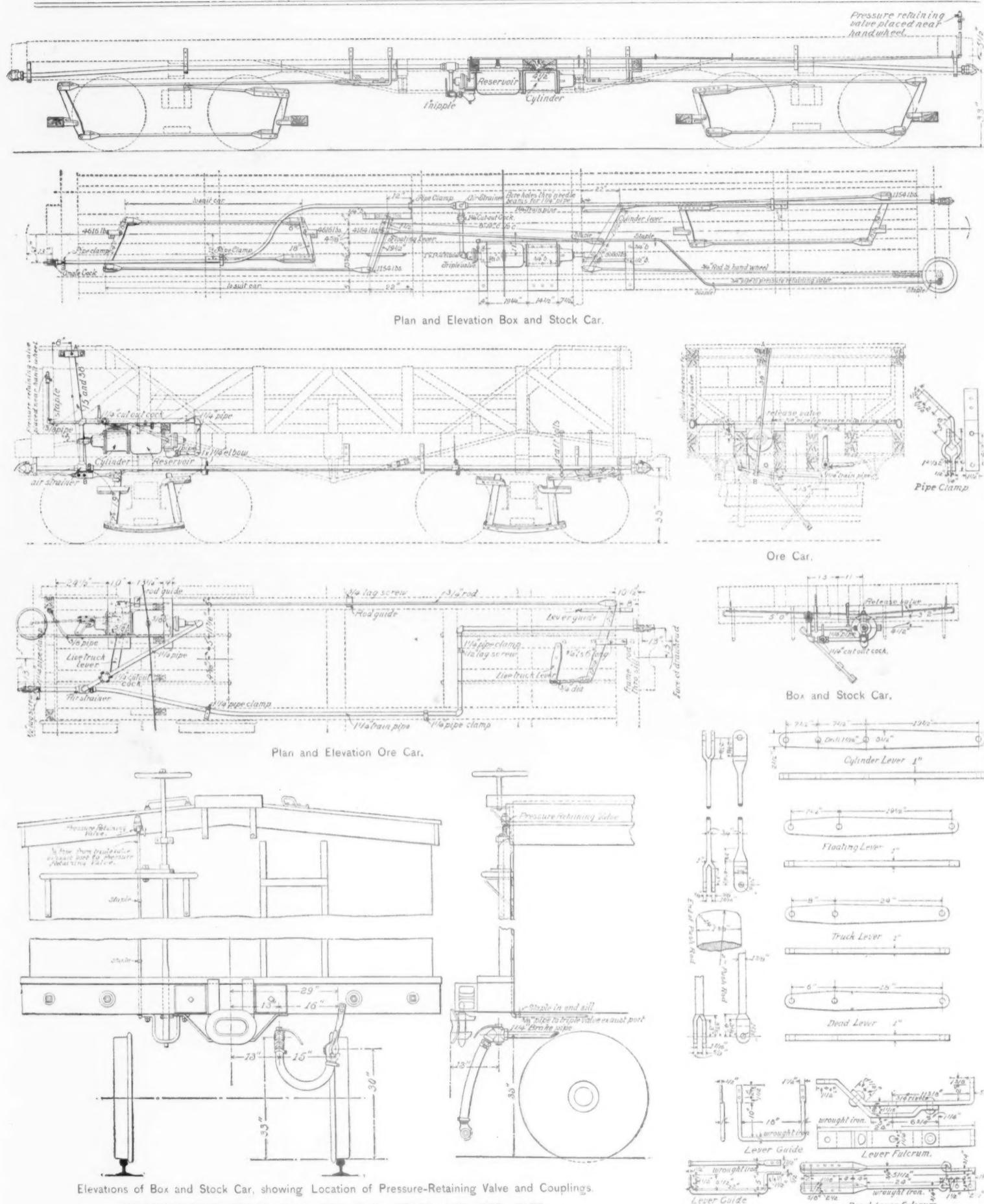
The disadvantages which have always been claimed for three and four cylinder engines are the complications, but when this question is considered in connection with the designing of a compound engine, it seems to me that an engine quite simple in its construction can be built. By having three cylinders of equal size, the high-pressure cylinder "inside" connected and the two low-pressure cylinders "outside" connected, an engine could be built which would in reality be no very wide departure from that very useful and favorite type, the "American" engine. The crank axle for the single crank would be simple in construction and the present valve gear could be kept with very slight modification. TENAX.

Foundation Brake Gear—Westinghouse Air Brake Co.

Since the adoption of the standard brake gear by the Master Car-Builders' Association, the Westinghouse Air Brake Co. has done much to improve the foundation gear for freight cars on various roads. The illustrations herewith show two kinds of brake gear, arranged for the Chicago & Northwestern by the Westinghouse Company. It is decided that the dimensions given are the minimum ones to be used with safety, as shown by the following memorandum printed on drawings: "The levers and connections shown hereon are designed to resist safely the strains involved. If smaller sizes are used, there is danger of rupture and bending when the brakes are applied." The following also appears on the drawings: "The relative angles of levers shown must be maintained when applying brake rigging to car timbers. Pipes to be bent where practicable and blown out with steam after bending. All connections to be perfectly tight and tested under pressure with soapsuds. All pipes to be securely fastened to car timbers to prevent shaking and unscrewing of joints. Use red lead sparingly at joints, and put only on outside of pipe, which screws into fitting. Never use it on inside of fittings, as it is apt to get into triple valves and interfere with proper working of brake."

The designs herewith, for box and stock car gear, were made by the Westinghouse Air Brake Co. for use on a car which weighs when unloaded 20,000 lbs., with a total brake beam pressure of 18,464 lbs. The gondola car weighs 23,260 lbs., and the total brake beam pressure used is 16,800 lbs. The flat cars weigh 20,440 lbs. and the brake beam pressure used is 14,464 lbs.

The completeness of these illustrations makes further



Elevations of Box and Stock Car, showing Location of Pressure-Retaining Valve and Couplings.

WESTINGHOUSE BRAKE GEAR FOR BOX, STOCK AND ORE CARS.

CHICAGO & NORTHWESTERN RAILWAY.

description unnecessary. In connection with these illustrations is also shown a portion of the standard drawing of the Westinghouse Air Brake Co., showing the location of the pressure retaining valve and the air brake pipes and hose at the ends of the car, together with the size of the piping to be used. This drawing is furnished by the Westinghouse Company for the purpose of encouraging uniform location of air brake parts, and the positions recommended are clearly shown.

Much difficulty has been experienced with the hose being left hanging down when uncoupled. The dirt and dust collect in the ends of the hose, and as soon as the air is turned on after coupling the dirt is driven into the triples, where it causes much trouble. It is hoped that by a proper location of the dummy coup-

ling the trainmen will be encouraged to hang up the hose.

The brake foundation gear designed for the ore cars on this road by the Westinghouse Company is novel and ingenious. It is no easy matter to arrange a brake gear for cars of this general type. This arrangement requires a minimum number of parts and so locates the details as to render them accessible, and out of the way of the hopper and connections. The air cylinder and reservoir are located as shown at one end of the car between the centre and intermediate sills. The piston rod connects with a long, vertical lever, fulcrumed on the top plate of the hopper at A. At the lower end of this lever, at B, is a short connection with jaws at both ends. From one end of this connection a chain runs to the

hand-brake shaft, and at the other end is a floating lever. One end of this lever takes hold of the brake beam lever and the other is attached to a long brake rod reaching to the brake beam lever at the opposite end of the car. Further than this the arrangement needs no description, because it is clearly illustrated by the drawings.

Wagner Buffet Car.

We show herewith a view of the interior of one of the "cafe" cars recently built for the Wagner Palace Car Co. by the Barney & Smith Manufacturing Co. The view is from a photograph taken in the smoking room, looking toward the baggage room. The arrangement of the



BUFFET, SMOKING AND BAGGAGE CAR FOR THE WAGNER PALACE CAR COMPANY.

Built by the BARNEY & SMITH MFG. CO., Dayton, O.

compartments is shown by the accompanying floor plan, in which letters indicate as follows: *A*, door; *B*, closet; *C*, cupboard; *D*, pantry; *E*, kitchen; *F*, buffet; *G*, refrigerator and meat locker; *H*, sofa; *I*, smoking room; *J*, desk; *K*, table; *L*, *L*, *L*, *L* seats; *M*, *M*, book shelves; *N*, saloon; *O*, washroom; *P*, baggage room; *Q*, *Q*, *R*, doors. Door *A* opens into the vestibule, but at door *R* there is no vestibule, this end being intended to run next to the engine.

The finish of these cars is antique oak, elaborately carved, with beveled, irregular top mirrors on wide panels of the side finish, held in place with Persian brass molding. The open partition between the main room and the sections has polished oak columns above the seat head rests, surmounted with wrought Persian brass grills. The main room is furnished with a variety of chairs elaborately upholstered with old red plush. The ceiling is decorated in relief and with gold leaf on artist's canvas, with heavy carved panel moldings of polished oak. The floor is covered with a sage-green Wilton carpet.

The buffet is supplied with large refrigerator cupboards, hot and cold water and necessary fixtures. The kitchen and pantry have all the conveniences of a dining car, but on a smaller scale.

The toilet room has a serpentine marble washstand. In the space between the sections and toilet rooms there is a library containing books for the use of passengers.

The cars are warmed by the Martin steam heating system, and lighted throughout with Pintsch gas.

The lamps, trimmings, grills, mirror mountings, etc., are of Persian brass of artistic design, and were furnished by the Dayton Manufacturing Co.

The Purification of Feed Water—Northwest Railroad Club.

In our last issue we gave extracts from a paper on the above subject read at the last meeting of the Northwest Railroad by Mr. C. N. Hunt. Extracts from a paper by Mr. J. O. Pattee, Master Mechanic, St. Paul, Minneapolis & Manitoba, follow. After stating the effects of scale in boilers he said:

There are but few problems connected with boiler repairs at which inventors have tried their hand to a

greater extent than the prevention of the formation of scale with more or less success; but before considering them let us consider the nature of some ingredients found in the water used. The mere amount of solid matter in any water is not an indication of its fitness for boiler use, as this depends entirely upon the nature of the solid impurities, the presence of 50 grains per gallon of deliquescent salts, such as carbonate of chloride of soda would not be a serious fault with frequent blowing off, whereas an equal amount of salts of lime without other chemicals would render it unfit for use.

We find the water in our streams, lakes and wells varies greatly in the amount of solid incrustating matter contained to the gallon. In larger lakes it also varies greatly at different locations. This, too, is the case with the water in the ocean. To show you that bad water can be used in boilers, we will state what we already know, that the ocean water is successfully used, but must be used with extreme caution, and is found to be rather expensive. It contains, according to good authority, about 38 parts to 1,000 of solid matter in the average open sea. Water in Lake Michigan contains about 6 or 7 grains of solid matter per gallon, while that in the Mississippi River above Minneapolis 8 to 10 grains, the Mississippi at La Crosse 10 to 12 grains. The two above are considered by many the best water in our Western lakes and rivers and are often taken as a unit when comparing with well water. We find in many of the deep wells 40 to 60 grains per gallon of solid incrustating matter; this depends largely upon the location and depth of the well. Very few wells on the Western prairie have water containing less than 30 grains per gallon, in fact any water containing less than 25 to 30 grains is considered good. We find the streams and lakes much purer than the wells. Analyses have shown (Mr. Pattee here quoted from analysis) the variety and amount of solid matter found in many of our Western lakes, rivers and wells, and add to this the amount of quicksand and other floating matter, which, mixed with the lime, help to form scale if not blown and washed out. Now suppose we have a boiler feed from a well containing only 30 grains of solid incrustating matter per gallon or one pound to 190 or 200 gallons, or, say, 5 lbs. to 1,000 gallons, which would give us at least 25 to 30 lbs. of this solid matter in a boiler each day, and we should

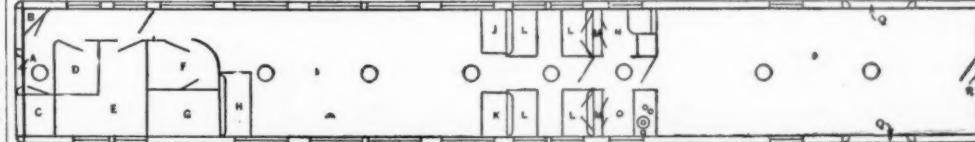
have the entire surface of the boiler covered $\frac{1}{16}$ -in. thick in three or four weeks unless a greater part of it had been removed by blowing off frequently or washing the boiler.

It is held in solution in fresh water by the excess of carbonic acid, and in reality it is a state of bicarbonate. By heating the water the excess of carbonic acid is driven off and the greater part of the carbonate is precipitated. Its solubility diminishes as the temperature increases; in other words, cold water will hold in solution a much larger quantity than hot water. It is for this reason that in water from which the air has been expelled carbonate of lime is found in much smaller quantities. Carbonate of lime is estimated to be soluble in 16,000 to 27,000 times its volume of water at ordinary temperature, or three to five grains per gallon. This, as stated, according to good authority, all precipitates at 300 degrees, and therefore it is one of the greatest enemies we have. It is being constantly precipitated as the water becomes hot and falls by its gravity to a resting place on the tubes and sheets, if not held in suspension by the circulation of the water long enough to allow us to blow it off. Its work is constantly being done, forming hard scale. Some of the best evidence of this is found in the formation of hard scale of this nature at the check valves where the water first becomes heated upon entering the boiler, and in some injectors.

Sulphate of lime acts much like carbonate of lime and is found in greater quantities and is next in importance. According to good authority its greatest solubility is at 95 degrees, where it will dissolve 178 grains in a gallon of water. At 212 degrees it will only dissolve 50 grains per gallon, and like carbonate of lime is completely insoluble at about 235 degrees. It is, therefore, evident that these two salts are precipitated when a boiler is worked at about 60 lbs. pressure, unless some chemical is used to make them more soluble.

Carbonate of magnesia or magnesia limestone is the next to consider. It is found in small quantities and its behavior is much like carbonate of lime and forms a hard scale on becoming precipitated.

These chemicals, after being precipitated according to the density of the water, the rapid or slow circulation, or the intensity of ebullition over those parts where the



FLOOR PLAN, WAGNER BUFFET CAR.

water moves rapidly, are held in suspension or carried to a more quiet part of the boiler where they are deposited to form hard scale.

Sodas and alkalis are considered non-incrustating solids, and in a proper quantity tend greatly to prevent the rapid formation of lime scale. Of the many chemicals used to prevent the formation and assist in removing scale, soda is one of the most common used, and no doubt is one of the most effective, but it must be applied in proper quantities, or it will cause the boiler to form.

Several methods of preventing incrustation and assisting in keeping boilers clean have been used. We will consider them in the following order:

1. Blowing off at the surface or at the base. This must be done carefully to prevent a waste of fuel; too much blowing off is expensive. If we blow off at the base, the better way is to blow off a quantity of water after the boiler has been at rest a short time, and the solids which have been held in suspension by the circulation of the water have settled to the lower part of the boiler and before they become fastened to the warm sheets, or after the boiler has been fired up and before it starts on its trip, or before the water has been agitated sufficiently to carry the small particles to the surface.

2. The construction of the boiler so as to give free circulation and the introduction of agents to increase circulation so as to hold solids in suspension until they can be washed out or blown off. We find quite a difference in the condition of our crown sheets when no stay bars are used and the circulation is free and rapid, and a small amount of the hard scale is formed during the time the water is in an agitated state. When the engine is set aside and allowed to cool down, all particles held in suspension find a resting place on the crown sheet, and fuses and all chemicals which are soluble in greater quantities in hot water than in cold also are precipitated, and find a resting place on all parts of the boiler as the water cools, and, if not blown off or washed out help to form hard scale. Boilers made with stay bars over the crown sheet are more liable to be found badly covered with incrustation on the crown sheet, for the reason that the circulation is greatly retarded and the lime or sediment, which is in other cases washed to other parts of the boiler, finds a resting place in and about these bars and stays, where it is often formed into one solid mass.

3. The introduction of chemical agents to render the impurities in the water more soluble, to prevent them from precipitating as quickly as the water becomes heated. I have tried nearly all the chemicals that have been introduced and recommended that I could learn of and all with about the same result. Few of them were of much value from the fact that in no two days the water used in a locomotive boiler is the same. To-day we take water from a well, which has a large amount of lime. The next place we take water from may be a well with no lime and a large amount of soda. The third may be pure water (if such a thing could be found in the Western country), so that no chemical can be introduced in boilers to take proper care of this great variety of waters used. The introduction of chemicals to remove the scale after it has formed in a boiler without dissolving it is dangerous, as the scale so loosened will fall in large pieces and lodge and burn out the sheets.

4. The introduction of a system of connecting pipes or apparatus through which the feed water passes, and in which the sediment may be collected and blown off. I have tried several devices of this kind, and while they have been successful to a certain extent, I did not find them capable of collecting more than a small portion of the sediment. The water only became heated enough to precipitate the lime to a small extent, and the only result was the saving of the expense of frequent washing. The scale formed nearly as rapidly as with the same water before they were used.

5. Removal of scale by manual labor. This is a sure method, but expensive and tedious.

6. An introduction of a system of purifying or treating waters at each well or source of supply. I think by analysis and a thorough knowledge of the water at each point of supply we may introduce chemicals or devise other plans of purifying the water so that when the water is thrown into the boiler it will contain the proper chemicals, one to act upon the other, or be by some other method purified so that we shall know when water is taken that it will be suitable for our use and thereby prevent pumping a wheelbarrow load of sediment into our boilers each day.

7. The introduction of a system of reservoirs made by damming the streams to catch the accumulation of soft water made by the melting of the snow in the spring and the rainfall which otherwise runs to waste; in this way we could secure at different points from six months to one year's supply of the best of water.

Very much has been done to remedy this great evil on many roads by a system of analysis of the water from each source of supply, thereby getting a thorough knowledge of the quality of the water and directing all bad wells to be abandoned and as little water taken from them as possible. I hope soon to see something of this kind established in St. Paul, either jointly with all roads or individually.

DISCUSSION.

Mr. MCINTOSH (C. & N. W.): I can give the ingredients of various waters on our line. The Mississippi River water at Winona contains 1.25 lbs. of incrustating solids per 1,000 gallons. The next station west that we analyzed contains 2.02 lbs. to the thousand gallons, or 14.53 grains to the gallon. That is the total number of grains of incrustating matter was carbonate of lime, 8; magnesia, 5.48; trace of oxide of iron and aluminum; silica, 70, and trace of alkali chloride. Our water along west as far as Kasson, about 60 or 70 miles from Winona, is about in that same condition. Then we get up on the table land at a water station called Claremont where we have 21 grains to a gallon, nearly 22, and that contains 3 lbs. of incrustating matter to a thousand gallons. Our next water station is Owatonna, and that furnishes nearly 4 lbs. and is considered pretty poor water for boiler use; 4 lbs. to a thousand gallons would be nearly 12 lbs. to a 3,000 gallon tank, which is a good deal. The total number of grains is 34.70; carbonate of lime, 16.97; magnesia, 9.71; sulphate of lime, 1.49; a trace of iron and aluminum; silica, 99; alkali chloride, 2.85; sulphates, 2.78. Mr. McIntosh gave further analyses in detail.

The city of Tracy has a well that we had analyzed recently with a view to using it if we could. We found it contains 112.69 grains to a gallon; in other words, 9.52 pounds of incrustating matter to a thousand gallons; we are not going to use it.

Mr. PATTEE: That means about a wheelbarrow load a day.

Mr. MCINTOSH: Yes, sir. We concluded to make other arrangements. We have the analysis of some artesian wells through Dakota. Huron contains 120 grains to a

gallon; 6.28 lbs. of incrustating matter to a thousand gallons. The artesian well at Harold contains 102 grains to a gallon, and there is only .52 lbs. of that in a thousand gallons; that is, incrustating matter. The well at Highmore, Dakota, contains a total of 103 grains to a gallon, and only .31 of a pound to a thousand gallons of incrustating matter. Others range in that ratio. We have the analysis of the first well that our company put down at Pierre, Dak., and it was a bad one. It contains 178 grains to the gallon; 133 of that was sulphate of soda. It made pretty lively work for the boys.

Mr. PATTEE: You found the Missouri River water filtered through the sand very good?

Mr. MCINTOSH: Yes, sir; we consider it the best water we have got on our division, although I have no analysis of it.

I have tried some compounds and never got any good results from them. Possibly with carbonate of lime you might use some compound; if you were using that water altogether that would help considerably, if you commenced to use it when you started out, and cleaned the boiler, and continued its use; but further West, where you have alkali water, I never could get any good results from it. Take a boiler that has been running some time, and has accumulated considerable mud, and put a compound into it, and loosen off the scale, and it will settle down among the flues, and have a tendency to collapse them.

We have used some purifiers, some of the mechanical purifiers for settling this lime and other matter before it goes into the boiler; some places we have had fair success with them, particularly in the western country, where there is alkali water, the purifier seems to have no particular effect on lime water. The water passes too rapidly through the apparatus, and does not have a long enough journey to settle this matter properly.

The PRESIDENT: I understand Mr. Ellis has some experience with purifiers; perhaps he will give us his experience.

Mr. MAT. ELLIS (C., St. P., Min., & O.): I have got a Smith feed-water purifier, have had it for 18 months. Last winter we run it seven months without washing the boiler out, and when we washed it out we only got about a bushel of scale. We used Mississippi water; that is very good water.

Mr. PATTEE: Speaking of the Smith purifier, there is no question but that it does a certain amount of the work which it is intended to do. We have six of them in service. By the frequent blowing off of one of the engines we were able to run it seven weeks without washing it out, but at the end of that time, on examination, we found that those solids which make the hard scale, which is most detrimental to the boiler, had formed nearly as fast as they had without the purifier. It had caught the mud and the part of the impurities which had precipitated quickly, but the length of pipe was not sufficient, or in other words the water did not get sufficiently hot while it was in the pipe, to precipitate the impurities in the water, and consequently they passed through into the boiler. It did the work to a certain extent, but it was not quite sufficient to do the work as we wished to have it done.

Mr. MCINTOSH: I would say in regard to the Smith purifier that the first engine we applied it to on the Dakota Division, No. 20, is running between Redfield and Gettysburg, where the water is very bad. Since putting that on, in February, 1888, after the engine had seen six months service, she has run up to the present time and is still running and there never has been a leak in a flue or a stay bolt in that fire-box since—that is, in Dakota between the Jim River Valley and Missouri, while other engines fully as well equipped, running in other localities, changing from one supply to another, have not done nearly as well. Whether it is because that water contains peculiar ingredients that causes it to work so well on that engine, or some other cause, I have not been able to ascertain yet.

The PRESIDENT: Something must be done in this western country, either by mechanical or chemical means, to improve the condition of waters used, or it will be an immense expense to railroads. It has been an immense expense, and it will continue to be so as the business increases, unless we can find some remedy. While business has been light on the various roads, it does not show up so bad; but now that the business is increasing, the number of trains increasing and the size of engines increasing and the amount of water used, stopping an engine every 100 or 125 miles to wash it out, taking two or three hours, is an expense not only in regard to the engine but because of the delay in time and in getting over the road. I think the master mechanics ought to encourage the manufacturers of different devices by giving them a good fair trial.

Railroad Signals—New England Railroad Club.

In opening the regular monthly meeting, Dec. 11, President Richards announced as the subject for the January meeting, "Notes of Foreign Travel."

He introduced Mr. R. H. Soule, of the Union Switch & Signal Co., who opened the topic by a paper, extracts from which we gave last week. Some discussion followed the paper.

Mr. FRENCH (Old Colony): We have done considerable on our road in the way of block signaling and with electric signals, and also interlocking. We commenced with block electric signals a number of years ago, using the Hall system, which answered very well then, when traffic was lighter than now. After a while we abandoned the Hall and put on the present Union signal, worked by electricity. We have not used automatic signals. We have now the Union signal, high circuit, through the rail and overlap, which we consider an excellent thing, and we are extending it; have put in five or six miles this fall. With these block signals there is no need of any trouble if the engineer observes the rules given him. If he sees that the signal is white it indicates that the road is clear, and he proceeds, provided that the white signal turns red in his face. He goes through that section, which may be half a mile, and passes into the next, taking notice of the next signal. He is then in the overlap, and is protected until he gets under the protection of the next section. While using these signals we do not relax any of the precautions which the service requires. There are times when some of the mechanism of these signals may fail to work properly. If the engineer finds that the white signal does not turn to red in his face, he will then slow down and go as cautiously as if he had found the signal red, which indicates danger. We have found this system to work well on our road. We have in use a system of locking and interlocking, which we consider a very important feature; also the derail switches, which, in case the engineer does not mind the danger signal, will let him on to the ground instead of into a train at the cross

ing. Mr. Soule referred to the signals of the Boston & Albany as indicating by their position the direction to the engineer. We have taken those signals and added color to them as a surer guide.

Prof. C. H. KOYL: I think too much stress cannot be laid upon two or three points as of extreme importance. First, having all railroad trains run on the block system instead of the time system of signals; second, the necessity of continuing the colors of the signals. From the earliest days of railroading the red light has been a danger signal for trains; and it seems to me the signals should retain their colors as well as have the added feature of position. In other words, where illuminated semaphores are used they should be for danger at night, not only horizontal, but red, and not only inclined for safety, but white. If the same arrangement can be made for the day all the better. There are many instances of collisions due to the inefficiency of time signals; in nine times out of ten, rear collisions are attributable to this cause.

Mr. LANG: The system in use upon the New York & New England Railroad is similar to that on the Old Colony, and I think we operate it substantially in the same way. Some railroad men seem to think that as soon as they get signals in position they will work right along and do their duty without any attention. There was never a greater mistake made, for electric signals, like any other kind, must be watched, and watched carefully and intelligently, to have them do their duty properly. They require just as much care as the motive power, the rolling stock and the track. If constantly attended to with such care, they will do what humanity will not do; they will operate with almost the intelligence of a human being, and will never get drunk or go to sleep on duty.

The subject was further discussed by Messrs. Welch, Soule, Coughlin, Lauder and others, after which the meeting adjourned.

Gas Jacketed Steam Cylinders.

Mr. Bryan Donkin, Jr., has recently made some experiments with a small steam engine, diameter, 8 $\frac{1}{2}$ in.; stroke, 14 in.; heating the external walls of the cylinder by the flame from Bunsen gas burners. An asbestos jacket was fitted to prevent radiation, and there were holes in this jacket for the escape of the products of combustion. The engine was tested both condensing and non-condensing, the point of cut-off being the same in all the experiments. The table of results shows clearly the economy in steam of heating the cylinder, and the gas consumption being given, it is easy to calculate, for any assumed price of gas, the absolute economy of this mode of jacketing. The initial temperature of the steam in these experiments was about 280 degrees Fahrenheit, and it appears that the temperature of the cylinder walls exceeded this figure when non-condensing, but was less in the condensing experiments; although the steam economy was rather greater in the latter case. The table of results will probably interest engineers:

Item.	Non-condensing.		Condensing.	
	Without gas jacket.	With gas jacket.	Without gas jacket.	With gas jacket.
Duration of experiment hours.....	4	4	3	3
Initial pressure in cylinder, pounds per square inch above atmosphere.....	31.7	34.7	31.7	33.8
Pressure in boiler, pounds per square inch above atmosphere.....	35.5	35	35.5	34.5
Revolutions per minute.....	90.73	90.79	89.7	90.1
Indicated horse power.....	6.26	6.17	6.3	6.31
Pounds of feed water hourly per indicated horse power.....	44.4	34.1	33.8	34.8
Cubic feet of gas burned hourly to heat jacket.....	0	49	40	35
Pounds of steam hourly indicated horse power, calculated from diagrams.....	35.87	24.42	34.37	28.3
Percentage of steam accounted for by indicator diagrams.....	80.	101	101.75	73.5
Temperature of external cylinder walls, measured at top, Fahrenheit degrees.....	248	414	336	213
			239	240

To Get Good Indicator Diagrams.

The following data with reference to the defects of steam-engine indicators are the results of an investigation into the operation of such devices by Mr. J. Burkitt Webb, and were presented to the American Society of Mechanical Engineers at the New York meeting. He states:

It must be evident *a priori* that one indicator might be the best for one purpose, and another for a different use.

Now an indicator may be used for three things:

(a) To obtain the area of the true card, as representing the work done per stroke.

(b) To obtain the pressure at some particular point of the stroke.

(c) To obtain the shape of the true card, as indicating the condition and action of the steam and various parts of the engine.

There are nine features of indicators which affect the accuracy of the results, when determined for the three purposes, *a*, *b*, *c*, as follows:

(1) Uniformity of the spring.

(2) Parallelism of the piston movement to the cylinder.

(3) Uniformity of the pencil movement.

(4) Parallelism of the pencil movement to the drum axis.

(5) Accuracy of the drum motion.

(6) Phase of the drum motion.

(7) Mass of the parts and its distribution and the strength of the spring.

(8) Friction of the piston and pencil movements.

(9) Lost motion.

As a result of these investigations the following remarks may be made as to the action of an indicator:

For the purpose *a*, the card is affected by 1, 2, on account of the friction of the piston, 3, 5, 6, 8 and 9. A fault in 2 may appreciably alter the area; faults in 1, 3, 5 and 9 may be allowed for; 6 always reduces the area of a steam card; 8, so far as produced by a fault in 2, generally increases it; 7 acts indirectly. The stronger the spring for the same piston and pencil movement, the less the energy stored in the oscillation at the beginning of the stroke, and the less the time required for the friction to absorb it, and the greater the remaining time during which the friction affects the area directly. During the oscillation the area is affected by the fact that the motion of the drum is not uniform. Were it so, the areas added to and taken from the true card by the oscillations might balance each other, but, because the distance of the pencil from the end of the card varies nearly as the versed sine of the crank angle, oscillations near the middle of the card will occupy much more space lengthwise of the card than those at the end, and the exact balancing of the areas given and taken from the card is more complicated. The shorter the period of the oscillation the sooner it will die out, which is an additional reason for using a strong spring, the other reason being given above, so that a strong spring conduces to accuracy in *a*.

Most of the things affecting *a* affect also *b* and *c*, but in different degrees. If the pressure is desired near the end of the stroke, 7 affects it but little, and 6 has little effect on a pressure near the beginning of the stroke; 7, independent of friction, has no effect on the shape of the card except that the oscillation makes it necessary to supply a part of the card by estimating a mean line throughout the extent of the same. Friction affects both pressures and shape seriously, and considerable change of shape is often due to 5 and 6.

The drums of indicators could be made adjustable as to their time of oscillation by furnishing several springs with them, and adding an arrangement for altering the length of the springs in the same way as the hair spring of a watch is regulated. Instead of this device, masses adjustable radially could be attached to the drum, by which the moment of inertia thereof could be changed. Overstepping with light springs can also be prevented by making the cord connection double, *i.e.*, by using an endless cord stretched over pulleys. I believe, however, that for accurate work it might be better to run an indicator drum continuously by a belt from the engine shaft, and to get the area of the card by adding together a sufficient number of ordinates, so spaced as to allow for the change in the card due to the change in the motion of the drum. This would simply require a suitable parallel grating for ruling the ordinates, and would give several distinct cards in succession, instead of superimposed cards, when the operation of the pencil is not confined to one stroke. A planimeter might be made for such work, but planimeter work is not in general so accurate as the method by ordinates.

The Hambay Detector Bar and Rail Clip.

We illustrate herewith the Hambay detector bar and rail clip, which are controlled by the Union Switch & Signal Co., and are being extensively used in connection with interlocking plant of their manufacture. The original forms used in this country were based on English practice, the detector bar being of angle-iron section, placed inside the rail, while the clips were either bolted through the web or clamped by vertical bolts to the base; the first method was expensive and the second was unsatisfactory for several reasons. The new Hambay detector bar and rail clip in their application and operation are free from the disadvantages of the old arrangements, as the clips are attached to the rail base by horizontal hook-bolts, which do not require holes in either web or flange. The bar, when moved from its normal position, rises in a plane which is inclined to the vertical, thus assuring the certainty of its contact with any passing wheel. The complete arrangement of detector bar, rail clips, etc., of this style weighs less than one-half as much as the old patterns, thus economizing in the use of material and the cost of handling and transportation, and reducing the labor of operating. These devices have been very largely applied in practice, over 40,000 of the rail clips having been used within a year. Certain features are patented.

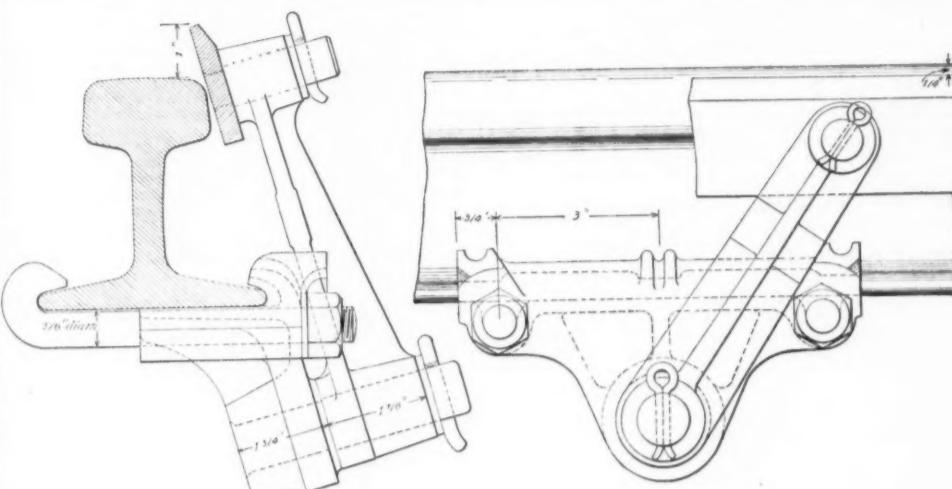
Joint Inspection of Cars—Western Railway Club.

At the December meeting, Mr. P. H. Peck (Chicago & Western Indiana) opened the proceedings with a paper on the above subject. Extracts follow:

Chicago has become the largest railroad centre of the world, and with the extensive growth of the West and Northwest, the interchange of cars between railroads at this point has grown faster than some of our best informed officials anticipated. The car movement at Chicago has been steadily increasing each year, until it is estimated that the interchange now amounts to between 4,000 and 7,000 cars daily, and I think I am safe in saying that 30 per cent. of these cars are more or less defective—require a defect card in transferring. The limited yard room and tracks we have in the city for this vast business makes the inspection of cars both expensive and deficient, and keeps a large number of cars out of service in busy times. It also causes extra switching, involving blocking side tracks and delaying freight, thus causing any amount of trouble to car departments, and complaints from our superior officers and patrons. The only way, I think, by which we can avoid this trouble is by establishing a system of joint inspection at the different junctions or points of interchange.

All the railroads terminate here. All through cars for the East or West are transferred either by the roads bringing the cars to Chicago or by some transfer line. Other cars, consigned to Chicago industries, that the roads bringing the cars into the city have not access to, also have to be transferred by some foreign road or transfer company, making it impossible to do this interchange transfer work with M. C. B. defect cards.

All those cars are received and delivered with notations kept by the inspectors at the junctions or yards where cars are received. In the month of October, 1888, the Belt Line received at nine of the largest junctions 27,202 cars, of which there were notations against 9,123 cars, or 34 per cent. of the number received. The per cent.



THE HAMBAY DETECTOR BAR AND RAIL CLIP.

Made by the UNION SWITCH AND SIGNAL CO., Swissvale, Pa.

of defects varied at the different junctions from 21 to 62 per cent.; all of these defects would have had to be carded if the M. C. B. rules had been adhered to, and many hundred dollars' worth of repairs would have been done by foreign roads which the owners desired to do on their own repair tracks.

I think the present system defective for the reason that we have four transfer lines or tracks over which these cars can be transferred to other lines, all receiving and delivering by notations kept by inspectors. A defective car may go to a road over one line, and be unloaded and billed home over one of the other lines, but it will not be received by its own road, as the inspectors have no record of it. The cars will then have to go back and be returned to the first line that handled it, thus causing a long delay, as the car will have to be traced to find the first route it was transferred to so as to pass the same inspectors. [The writer gave an example of a car hauled over 40 miles, and switched in several yards through an expensive territory in which to handle cars.]

The expense that I wish to direct special attention to is in the inspection; there are too many men employed to inspect cars on this method. Each company now has inspectors of its own at each junction. Both inspectors do the same work, but for two companies. For instance, at a junction of two roads each company has one day and one night man, making a total of four men. They will inspect the cars together, both making the same record, but for two companies. One day man and one night man could keep the same records for the two companies just as well and just as correctly. The cost per car for inspection for seven of the eight junctions at Chicago, for October, 1888, was from .022 cent, the lowest, to .036 cent, the highest. At one of the junctions there is joint inspection, and the inspection there was only .017 cent per car, showing a saving of $\frac{1}{2}$ cent on the cheapest and .013 cent on the highest junction. I think I am safe in saying that between 35 and 40 per cent. could be saved by joint inspection and a better service would be rendered, and furthermore, we would not have so many cars out of service.

The joint inspectors would be furnished with cards to be used in the city, to fasten on the cars with the first record, showing that the car was received by joint inspectors. That record would take the car home over any route or junction where cars are interchanged. Inspectors could use their judgment about using a M. C. B. card on perishable freight, avoiding delay when the car was safe to run. All the joint inspectors would report and receive their instructions from a head of that department located in the city.

Joint inspection is working very nicely in Kansas City, St. Louis, Cincinnati, Buffalo and Detroit, and has been a great assistance in keeping the freight moving without unnecessary delay.

I have arranged and adopted joint inspection with the Wabash Railway at Chandler, and I find we have very little trouble and very few delays owing to bad orders. The cost of inspection is much cheaper per car, averaging only .016 cent per car, against a general average of .026 cent for same month last year.

I find on the Belt Line that the average cost per car for inspection is too great compared with the average cost for repairs. In January, 1889, the cost for repairs was .046 cent, and for inspection .031 cent. In June the average cost of repairs was .044 cent, and for inspection .029 cent. In October repairs per car cost .033 cent, and the inspection cost .025 cent. In the largest month the repairs cost only .015 cent more per car than the inspection. In the month of October the repairs per car cost only .007 cent more per car than the inspection. All of which shows me that under the rules, standards, etc., of the Master Car-Builders the repairs of cars have almost reached the lowest point of economy. But in the present system of inspection in this city there is large room for increased economy. To gain this economy all heads of car departments will have to unite and adopt suitable rules to govern inspection the same as the above-mentioned cities have.

DISCUSSION.

MR. BARNES: I would like to ask Mr. Peck the general nature of the defects he speaks of.

MR. PECK: In general, the defects are in the drawbars and the drawbar attachment.

MR. BARNES: Which portion of the drawbar is found most troublesome, or which portion of the attachment.

MR. PECK: It is sometimes one thing and sometimes another—often drawbar lugs. I have known a car to be hauled in this city 22 miles loaded, and the repairs of it cost 11 cents for two $\frac{1}{4}$ -in. bolts.

THE PRESIDENT: Mr. Peck, did you find the bar lugs broken or the bolts broken, or did you find both the case?

MR. PECK: Generally the bolt; sometimes both, but generally the bolts broken in switching.

THE PRESIDENT: Do you find great trouble with the springs of drawbars?

MR. PECK: No, not so much as with the other attachments.

MR. VERBRYCK: We have joint inspection at Kansas City, Council Bluffs and Denver, and in Kansas City and Denver it is very satisfactory, but not at Council Bluffs. At Kansas City we have a man who is joint inspector, and he is impartial, I believe. We don't have quite as much interchange with the Belt Line as other roads do on account of having our own line; but I think if it could be arranged to have joint inspection at points where there is a great amount of interchange it would be a good thing and save the company's money.

MR. SCHROYER: The condition of our yards will govern very largely the point of the joint inspection. I know of but one place on the lines in Chicago where joint inspection could be carried on to advantage, and that is between the Chicago & Northwestern and the Belt Line. We could have a joint inspector there for the reason that both yards are right together. I don't understand how we can use a system between all the roads. Our yards are so situated that we could not get a joint inspector to look over them. As far as our road and the Belt Line are concerned, we could have a joint inspector. I presume as far as other roads around Chicago and the Belt are concerned they could have joint inspection, but the Belt Line around Chicago has but a very short distance to haul cars when they deliver them to the B. & O. from the Milwaukee road, and the B. & O. turns them back to the Milwaukee by the way of the Belt, as stated by Mr. Peck. If a defective car is delivered in that way by the St. Paul to the B. & O. the inspector who receives the car from the Belt has no means of knowing it, consequently he will refuse to receive such a car from the Belt, and the result is that the Belt Line will have to haul that car back to the parties it was received from. We have a good deal of trouble from that source. To reduce these difficulties to a minimum we have used on our road what was discussed three years ago by the Western Railway Club, and that is a red card; and our purpose for using that card was this: we received cars from a great many roads around Chicago having minor defects, but which did not render the cars unfit for service. Under the Master Car Builders' rule, the inspector should have sent the car to the parties delivering it for the Master Car Builders' card, which sometimes entailed the delay of the car for some three or four days. The result was that our yards were crowded with loaded cars that should have gone on, and our officials decided to accept any car, the defects of which could be repaired for \$5, rather than to let the car stand around in our yards, and it was cheaper. This red card system was adopted by us, and when a defective car is received at any point, it has a red card attached to it, stating the nature of the defects in the car when they received it, and requesting trainmen or agents to return this car to the point at which it was delivered. But you all know how it is with reference to trainmen; if they feel disposed to return a car they will do it, and if they don't they won't; and we sometimes receive a car at one point, and it is delivered to some other road; and the result is, that the car goes away, and has the red card on it; and frequently we have bills rendered against us for repairs.

If we ourselves and all of our men were honest the conditions that now exist would not prevail; there is an inclination among our inspectors around Chicago and at other points to beat somebody else, and that is a great mistake we are making. The trouble is in the fact that we don't inspect our own cars rigidly enough. What will result when the Belt Line delivers a train of cars to us for inspection? What is the result with our own men? They don't inspect it at all. Our men depend on the Belt Line's inspection, and if they know that there is a defect in a car they will say nothing about it in hope that the Belt Line will take it, and the probabilities are if the Belt Line returns that car to us with a card showing the defects our men will refuse to accept it, although knowing very well that the defects were in the car when it was delivered. Unless there should be a joint inspection with subordinate officers or subordinate foremen in charge of all the yards around Chicago I don't see how it is possible for us to establish a system.

MR. PECK: That was my point exactly. It makes the car service association have head in the city, and they would be one responsible. As Mr. Schroyer says, there would be one inspector. If there were four roads there would be four. I do not see why we could not do this and stop detention in the city. Where a car is defective and gets switched around, when it comes back it is a pretty well used up car.

THE PRESIDENT: Mr. Schroyer, you spoke of a code of rules to govern joint inspection. Did you mean that a set of rules was necessary to govern joint inspection? Cannot joint inspection be governed by the M. C. B. rule?

MR. SCHROYER: I think that the Master Car Builders' rule will govern every point of issue. If it was possible to live up to the Master Car Builders' rules we would have our yards around Chicago blocked with freight that it would be impossible to move; and if a system of

Joint inspection around Chicago was to be established it would be necessary to have a special code of rules based on the Master Car Builders' rule; and I want to say too, as regards that, that I cannot see wherein we would save any money in a system of that kind. We don't expect our inspectors to inspect a train of cars, and, after the train of cars is inspected and disposed of, to go and sit down and wait until another train of cars comes along; but when cars are received needing light repairs it is his duty to make them and let the car go on. I imagine that I would not allow one of my men to refuse a car for two $\frac{1}{2}$ or 6-in. bolts, and neither would our officials if they knew it.

Mr. PECK: The object, I understand, of joint inspection in Chicago is to get the car back home to keep it from blocking the yard, and stop this trouble and unnecessary hauling of cars.

Mr. MORSE: Mr. President, I am not particularly interested in Chicago, but in Detroit we have a joint inspection. It is working very nicely, indeed. I cannot say that it is saving any expense in the way of inspectors, but it saves a great many disputes, as the joint inspector is an arbitrator, so to speak; and whenever a controversy arises between any two inspectors, the joint inspector's decision is final in the matter; and I can say that we have very little detention of cars. The only detention that there is, is in time taken by the joint inspector going from one point to another.

Mr. SCHROYER: We have this difficulty constantly arising under the Master Car-Builders' rule. We receive a car from the C. B. & Q. in a damaged condition; it is damaged so that the car is unsafe for service, and we of necessity have got to take that car to our shop to repair it. In the transit of that car it is damaged very much more than it was when received, which is solely due to the damaged or weakened condition of the car when we received it, and in all such cases as this we have got to stand the expense of the additional repairs. This is an injustice which exists to-day, and which the Master Car-Builders' rule don't provide for.

Mr. FORSYTH: It seems that a little more could be done if it could be taken up by the superintendents of car departments and those having charge of car inspection in Chicago. I make a motion that this association cause to have sent a copy of this paper to the superintendents of car departments and suggest they call a meeting and try to formulate a joint inspection plan.

The motion was carried.

Mr. PECK: I am very glad to see the club do this, because I am reliably informed that if the heads of the car departments do not do it before long the general managers will.

Mr. Schroyer's motion that Mr. Peck be appointed a committee of one to name a day and call together the heads of the car departments centering in Chicago for the discussion of this subject was carried.

It was moved, seconded and carried that the secretary of the Western Railway Club be instructed to wire Secretary Cloud, of New York, to-night that the Western Railway Club desires that the Master Car-Builders' Association shall meet at such place as the Master Mechanics' convention may be held at.

President HICKEY: The subject which will come before the club at the meeting in January are, first, "Ventilation of Passenger Cars," and second, "Efficiency of the Link as Compared with other Valve Motions."

Testing Laboratories for Railroads—Western Railway Club.

At the December meeting of the club Mr. Gibbs (C. M. & St. P.) introduced the above subject. Extracts from his paper follow:

I do not wish to offer anything in the nature of a paper, but merely to indicate the headings upon which, in my opinion, discussion may be profitably based. I have the honor to be one of a committee to report upon this subject to the next Master Mechanics' Association convention, and although I speak entirely for myself, I am sure the committee, as a whole, will profit greatly by what may be said at these meetings. The organization by railway companies of departments, headed by specialists, for the purpose of conducting experimental work outside of the routine of mechanical work and for passing upon the character of railway supplies, is a comparatively new idea, and, as yet, confined to a few only of the greater railway systems of the country.

The head of a "Department of Tests and Experiments," as it may be called, occupies a position of great difficulty, if he did but know it; his position has not yet been clearly defined. If a scientific man, purely, and inexperienced in practical work, he will almost certainly fail at first to appreciate the delicate nature of railway organization, will overstep the bounds of his legitimate field, and thus lose the respect and assistance of his superior officers when they are most needed. A man determined to at once bring everything to a fixed ideal standard may become worse than useless, a serious hindrance to economic operation. Supposing he has steered clear of both these rocks, there is another difficulty he has yet to surmount, that of confining his investigations to subjects which are susceptible of scientific analysis and thereby furnish opinions which will command respect and not arouse ridicule. The danger that he will be asked to furnish solutions of each and every problem under the sun which seems to the practical man mysterious and, therefore, "scientific" is not so remote as it might appear. No logical opinion, however, which is not founded upon exact data is reliable. I am here treating test departments as scientific bureaus merely, and is this not their proper function?

Perhaps the first work of a department of this character—and work which it may prove of great utility, or the reverse, I may add—is the regulation of the character of the supplies, establishing a standard of quality, one practically attainable, and afterward seeing that the same is maintained. This constitutes the routine work of the department; and the amount of worry and annoyance which may be saved the heads of the mechanical and purchasing departments by having the contradictory claims of rival manufacturers definitely set at rest by actual test can be readily appreciated.

Of course the economic results of this policy are of first importance; if establishing a standard of quality seriously increases the cost of supplies, it will be necessary to prove that the money is got back in other directions, which even when true is an exceedingly difficult matter. But I really believe that our experience has been satisfactory in this respect, taken as a whole. In some cases we do buy more costly material under specifications, but in others less so. Again, the cost is not proportionately increased with the quality for several reasons, of which may be men-

tioned competition and the constant effort to improve quality to meet demands by cheaper processes. Then, at times, manufacturers are really able to supply cheaper goods under specifications than without, as they know definitely what is called for and do not have to supply a higher grade to cover uncertainties; in other words, their responsibility is confined to filling certain definite tests and the guaranty of service shifted to other shippers.

We have here, then, a department designed to handle the great variety of subjects, which are constantly arising in progressive railway management, from the position of scientific experts. One branch of the subject deals with a system of uniform tests designed to supply an accurate and quick method of arriving at the results of practical service; the other extends over the almost limitless field of the arts and sciences as applicable to the modern art of railroading.

President HICKEY: You have heard the very interesting paper read by Mr. Gibbs. Years back the Master Mechanics' Association discussed this subject from time to time, but nothing ever came from it. This subject is a very important one. It is only through these means that we have a sure way of determining the material that is to be used for certain things around the rolling stock. Its establishment is not a very expensive matter.

It was thought at one time that the Western Railway Club would get up something of the kind for the benefit of the club, and it was talked of very strongly. It seems to me that a good central point for such an institution would be very beneficial.

Mr. GIBBS: I started out to indicate some heads that might be discussed. Mr. Barnes and I are members of the committee, and what we want is exact data as to the experience the railroads have had in these laboratories, something about the cost and organization, the number of men needed and the amount of material they handle, and so on. I am sure the members here have figures on these points. I preferred not to bring any forward myself. They will probably come later. This is merely a starter.

Mr. BARNES: I would like to ask some of the gentlemen present, who are familiar with the apparatus at present used in such laboratories, if it is sufficiently accurate for ordinary purposes. I believe there is a prejudice against chemical laboratory tests, which involves a little discussion between experts regarding the efficiency of the apparatus in use. It is my opinion that the apparatus is good enough for all practical purposes, and that the differences in it are too small to influence practical work. I think there is dispute over the oil-testing machines and the tests which have to do with the viscosity of the oil.

Mr. FORSYTH: If I may be allowed a few minutes of your time, I would like to say, that I was probably connected with the first railway test room in this country during the early years of its operation. It was started in Altoona, in a dingy old room over the erecting shop, and Mr. Rhodes was the first railroad engineer of tests. He was afterward followed there by Mr. Cloud, and for a time they alone were the only ones in charge of the department. I came there soon after Mr. Cloud as his assistant, and the only test apparatus we had was an old machine which was operated by hand, and that machine was used for transverse tests of iron and steel for probably a year or two. Then came Professor's Thurston's oil-testing machine. It was a small apparatus about as large as that fan (indicating a fan about a foot and a half in diameter). We used that over a year probably, trying to get some results from it, when we made a specification requiring that the oil-test machine should use a full sized journal, and then Prof. Thurston had made at Pratt & Whitney's works the present style of oil-testing machine. That was followed soon after by his machine for getting the resilience of iron and steel. Now, in all that time we accumulated sufficient knowledge on the subject to begin to make specifications, and the results of those specifications were not only a benefit to the railroads, but a benefit to the manufacturers, for they taught them how to make better material. That is the way the work went along until quite a number of railroads now have their testing departments.

The testing rooms have gone through a period of establishing specifications and testing material under requirements, and the work has practically got into a state of routine, so that the principal occupation of the engineer of tests and the railroad chemist is to simply see if the material meets specification. Now, of course, that is one of the most useful and legitimate purposes of these testing laboratories; but I think they have a larger and equally important function in original research. The matter of testing to meet specifications should be relegated to an assistant, and the man in charge should be allowed to devote a large portion of his time to original research. We have been testing oils for lubrication for the last fifteen years, and I think I am safe in saying that neither the railway chemists, the engineer of tests, nor the oil manufacturers know very much about lubrication, or the qualities of oil used in lubrication. What we want to get at, as a useful thing for railroads, is, What is the best oil which can be furnished for, say \$1, and give the most and best lubrication? I suggest as one subject that the committee of the Master Car-Builders' Association on test rooms should emphasize in their report, and they should recommend that the people in charge of these laboratories begin to do some further original research on the subject of lubricating oils. In the matters of the metals, iron and steel, I think the test rooms can be given a great deal of credit for our present knowledge. It is largely due to them that steel has been more generally introduced in the construction of locomotives, and, indeed, in a great many railroad structures. But there still remains, I think, something to be learned about the strength of steel and its other qualities, because, in spite of the best knowledge we can get on the subject now, it is a fact, that although steel is recognized as a superior metal to iron, our best railroad men prefer to use for some parts wrought iron. In the matter of testing machines for metals I think very little further remains to be done. In my opinion the machines we use in this country are far superior to those in use abroad. The best machines of Riehle and of Olson are certainly good enough for most work on railroads, and those of Emery are certainly adequate for the most refined investigation.

Mr. SCHROYER: We use different kinds of oil. One person will say: "I consider lard oil the best lubricant." Another person will say: "I consider a superior grade of tall oil better than lard oil." Then I have some of the black oil men, who show me the report made by some scientific man that petroleum oil is as good as 140 against lard oil at 100. Well, I don't take very much stock in these results, for the reason that the machine on which these tests are made is not reliable. I would like to ask Mr. Forsyth if on their apparatus for testing

lubricating oils they can get the same results two or three times with the same kind of oil, on different tests, or close enough to be practicable.

Mr. FORSYTH: I haven't very much defense to make for oil-testing machines, but we have done that repeatedly. I think that Mr. Sargent or Mr. Ellis here can tell us something about oil-testing machines.

Mr. ELLIS (C. B. & Q. Chemist): We have in our laboratory what is called the "Thurston Oil Tester," and we have been making tests of specimens of black oil for the past year and a half, but the results we have obtained are merely comparative. This machine does not tell exactly how those oils will work when they are in service, but we do claim that we can tell something of the comparative worth of oils when we run that machine under the same circumstances, that is, with the same person, same pressure, same speed, and the same time used in the test. If every oil that is brought in is run under those circumstances, we think we can arrive at some estimate of the value of the different shipments of oil, and probably of how they will work in service. In our laboratory we make tests, and we compare them with lard oil as a standard.

I wish to say a word also in regard to laboratories in general. The fact that there are some eight or ten laboratories now in good working order and well organized in the country, representing the large roads they do, seems to be a sufficient proof that they are of benefit to the roads. I think, as it has been pointed out this afternoon, that the work with oil naturally comes under two heads, that of routine work and that of original investigation. The routine work, as has been said, naturally comes down to mere tests, which ordinary help can do; it can be well referred to an assistant. After a road has a laboratory in existence some time, and suppliers know that the laboratory is in operation and that those in charge know and attend to their business, it is very seldom they send supplies which cannot be tested in the routine work. The result is that the laboratories, after they have existed some time, are not bothered with adulterated goods.

Mr. SCHROYER: I want to say that I am not yet satisfied. I do not get the information I am after. Now what I want to know is, if on the oil-testing machines with precisely the same oil you can get the same results twice, and if you can get the same results twice you ought to get them 50 times in succession with that same oil. Now is that machine accurate enough to give it to you? I know that in lubricating for only a short time or distance, an oil may be a lubricating oil and may have properties that will prevent it from heating and, again, it may be lubricating and it may enhance heating.

Mr. ELLIS: I would say that tests have been made on the Thurston machine, showing the endurance of the oil, but so far as our test is concerned, we do not carry them so far. We could not do it, but we carry them about one hour. The Thurston machine is not exactly what it should be. It is not a perfect machine, but the machine made by Professor Denman, who is in the employ of the Standard Oil Co., I understand is a very fine machine. He has been working on it two years at Hoboken, N. J.

Mr. SARGENT: I have never made any endurance test, Mr. Schroyer, in the way you state, but I have made tests in comparing the different bearing metals, which is practically an endurance test. I have had a constant flow of oil running on the journal, at the same pressure and the same speed, and have noted the rise in temperature, and also the rise in friction, as shown by the swinging pendulum. I have been able to duplicate these results without any difficulty for the different bearing metals, and also duplicate the rise of temperature. For instance, with a soft bearing, with the same oil, I have made as many as four or five tests following each other for one or two hours at a time, and have found that the same point is reached in the matter of temperature with that bearing, and that the coefficient of friction and the temperature become constant. It may heat up rapidly or slowly to that point, but it will get there and remain there with the same bearing and the same oil with the same pressure and speed. I have been able to duplicate my test under these conditions. But an endurance test is more difficult, for the reason that you have no way of keeping oil on the journal. The oil is right between the journal and the bearing, and it flies off more or less as it gets to the end of the bearing. There is no way of keeping it there, and it is only a matter of time, when your oil is thrown off the bearing, and then your test is worthless as to endurance.

We run our bearings to keep the temperature to 100 degrees, and we get as near as we can the same feed, and we run the test for an hour, giving eight ounces of oil, and we find that the coefficient of friction is constant from beginning to end, and the test with different metals has shown about the same results. I believe, however, the results can be duplicated under the same conditions.

Answering Mr. Barnes' question whether the tests we have to-day are practically accurate, I would say according to my ideas they are. We have two machines, a screw machine and a hydraulic machine, one of 200,000 pounds capacity and one of 78,000 pounds capacity. We frequently check them with each other and find that they agree closely, within 100 or 200 pounds of each other, which is near enough for testing material. Our machines are amply accurate enough for our purpose. The laboratory is a great check on the goods received. We send out specifications which have been drawn up by ourselves, to the makers, as a guide in furnishing us with the material. Sometimes a manufacturer would say they can supply us with material from these specifications, but we do not know whether they do or not until we test it. Our records will show a great number of cases where materials from good companies to whom we sent specifications, and from whom we buy a great many goods, are away off. I will say that our tests are not made to condemn material—we do not hunt around to find flaws to condemn it, but we try to receive it if it can be received—but we want to know that it is good.

Mr. DAVIDSON (C. & N. W. Chemist): I will say that on our own road, in addition to the routine testing, we try to do more or less investigating; for instance, on a subject like that of paints. We wanted to know why we didn't get better service from our paints, and we not only tested the paints we were buying from time to time, but went outside and bought other paints, and tried to find out why it was that some paints would not give as good service as others. In regard to the special boiler waters, we are accumulating information all the time, so as to be able, sooner or later, to take hold of the purification thereof. Then we have often found that a great deal of money can be saved by getting materials from different manufacturers of different articles which are in the market, and comparing them with our own.

Within the last two years railways have been urged to go into the use of steel axles for cars largely; there

have been a great many points brought out, and steel axle men tell one story, and the iron axle men tell another. On our road we have made an investigation of that subject, and looking into the manufacture of steel axles, we have made different tests which we formulated into a report to our general manager. We do all this in addition to the regular routine work, which is done all the same.

Mr. SARGENT: I do not want the Club to suppose, from what I have said, that we do nothing but routine work on our road; the laboratory has been in existence for quite a number of years, and the points about the boiler waters have been settled long ago. When a road has just opened up a laboratory, there are lots of new matters to be investigated, and there is not much routine work; they have got to build that up; and, therefore, you will find in the recent laboratories any amount of new investigation in the way of metals, waters and axles, etc., that is continually coming up. I may say in regard to the road I am working for, we have been investigating for the last ten years, and we have got records that are pretty complete on all these points, and in regard to the axles we find our method of testing axles the best of any to-day. We test the whole axle rather than a mere portion cut out from the axle. We get an idea of the whole strength of the axle, and it is much more valuable than a simple specimen cut from any part of the axle. We have found that iron axles, scrap iron axles, will answer our purpose, and after testing many steel axles on our road, we find that the iron axles are sufficient for our purpose. When the loads get heavier it may cause us to use steel axles, but we find so far that the iron is just as good as the steel, or that it does our work.

Mr. GIBBS: I would suggest that if the C. B. & Q. have got so much information about boiler waters, they give some of it to the other roads.

Mr. SARGENT: The experience of all the mechanical laboratory men, I believe, is that, on the railroads that they work for, the data that they get is the company's property, and they cannot send it out. We have a little book published by the C. B. & Q. on boiler waters.

Mr. GIBBS: So far as testing machines, I would say that a testing machine has two functions—one is the mechanism, and the other is the registering portion. The testing machines which are now employed in railway work, so far as the second requirement is concerned, are amply requisite; that is to say, they will register what is produced; but in some cases they do not produce all we want. For instance, friction is produced, and the results may be sufficient in accuracy for practical purposes, but we want to make the results of value as a means of absolute information. Now, a tensile testing machine I believe is sufficiently accurate. As to the equipment of a laboratory, I believe that a first-class laboratory should have a tensile testing machine of high capacity, one-hundred ton machine. It should also have, for convenience, one small machine of 50,000 or 40,000 lbs. capacity. An oil-testing machine I do not consider at the present time a necessity. Then a machine for rapidly testing a considerable number of springs is also needed, one that will not produce perhaps very accurate results, but will make the tests quickly. Of certain classes of springs we require every one to be tested, and it consumes considerable time if done in an very accurate manner. These three machines, I think, will start a fairly well equipped laboratory.

The PRESIDENT: What about the cost of them?

Mr. GIBBS: We have not bought anything for the last four years, so I presume I am not very well up on prices. I think a 200,000-lb. capacity machine can be bought for \$1,600; a 40,000 for about \$800. A spring-testing machine should not cost as much as that.

Mr. SARGEANT: Some time ago I inquired as to the probable cost of a first-class chemical laboratory, and I found it would take between \$4,000 and \$5,000 to equip one with the necessary apparatus to do ordinary work. I should say that \$4,000 at least would be a low figure. With regard to the oil-testing machine, it seems to me that you can get accurate results, or true results, on the Thurston oil tester, but I think the Denton is the best machine.

Mr. BARNEs: I would like to call the attention of the Club to the accurate manipulation of these machines. It has only been for two years that we have been able to get uniform tests of the tensile strength of cements. Most all of us believed that the strength of cements varied largely, even when taken from the barrel and mixed under the same conditions. However, at the Massachusetts Institute of Technology, after experimenting a long time, they found the defect was entirely with the apparatus and the manipulation thereof, and after correcting that the cements mixed from the same barrel under the same condition differed in tensile strength only about two or three per cent., whereas former results showed 15 to 20.

Notes from Pullman.

On Monday of this week the officers of the Pullman Company, together with invited guests, among whom was J. H. Olhausen, Esq., General Superintendent Central Railroad of New Jersey, visited Pullman to inspect the Lansberg automatic air brake. This brake has been applied to a number of Pullman cars, and a Pullman engine has been equipped with the Lansberg air pump, engineer's valve and driver brake. Several stops were made, which showed good working of the mechanism. The Lansberg system has been used to some extent on the Missouri Pacific. It has been designed with a view to interchanging with the Westinghouse brake in every particular. The couplings coupled with the Westinghouse and the valves worked well in the same train.

Mr. Pullman conducted the party through various departments of his works and entertained them at luncheon at the Pullman Hotel. Each visit to the Pullman Company's works shows new devices and new arrangements which that progressive company is continually making. The place is so vast and covers so much ground that the perfection of detail and the admirable manner in which all the machinery and shafting are kept up is always to be admired. Several carving machines were seen in operation. They are adapted to fine carving of any design. After the carvings are removed from the machines they are sharpened up by hand tools.

The extent of the recent fire at Pullman was not so great as reported, the loss not exceeding \$38,000. Had

it not been for the excellent water service from the water tower in the works the damage would have been great.

Among the recent improvements in passenger car construction is the use of an angle iron end frame which extends from the bottom of car on one side over the top and down to the bottom on the other side. This is used in connection with a sheet steel horizontal end plate located just back of the buffer, which is especially devised to prevent the telescoping of cars by other cars and locomotives in case of collision. It is believed by some that this end construction is superior in strength to the vestibule, and the two used together will undoubtedly make the strongest cars yet known. This design was invented by Mr. Sessions, Manager of the Pullman works, and a patent upon it has been applied for.

One of the most striking novelties to be seen in the latest Pullman car is a disappearing curtain rail. The hand rail on which the berth curtains are hung is separated into sections, and being mounted upon drop-brackets it can be swung into the (upper) berths whenever the latter are closed, thus adding considerably to the neat appearance of the car. These rails, instead of being polished, are covered with plush, and are used only when the berths are made up. Cars equipped in this way give one the impression of being larger than they really are. The removal of the rail and the bracket from the clerestory produces a most satisfactory effect on the interior appearance.

The Committee on Brake Shoe Tests.

The meeting of the committee on brake shoe metals and tests, held in Chicago this week, was well attended. The general committee, Messrs. G. W. Rhodes, D. L. Barnes, E. C. Case, and H. H. Westinghouse, arranged a scheme of tests, and appointed committees to carry them out. Two sets of tests are to be made, shop tests and road tests. The preliminary shop tests are delegated to the following committees, if the several roads consent:

Chicago & Northwestern.—C. A. Schroyer, E. B. Thomson, W. H. Marshall and H. A. Little.

St. Louis & Hannibal.—Mr. Driggs and N. J. Paradise.

Chicago, Burlington & Quincy.—F. W. Sargeant, Joel West, D. L. Barnes and W. D. Sargeant.

The committee will submit the results of their investigations to an adjourned meeting to be held next April. The Master Car-Builders' committee will then select such of the results as they think best for the official tests.

The following data should be observed and recorded by committees: (A) Careful measurement of friction under similar conditions, viz., pressure, speed, area and temperature. (B) Pressure, 100 lbs. per square inch. (C) Speed approximate to service down grades, viz., 20 miles per hour. (D) The surface of the metal tested to be 1 in. x 4 in. (E) The rate of wear of the material representing the wheels to be carefully recorded with each two-hour test. Tests should be made as applied to both steel-tired wheels and chilled cast-iron wheels. Other experiments, which appear to the committees pertinent, to be carried out and included in their report. The Master Car-Builders' committee will prepare and publish by Jan. 1 an outline of a plan for road tests.

THE SCRAP HEAP.

Notes.

Judge Brewer, in the United States Circuit Court, has granted an order preventing the treasurers of about seventy-five counties in Kansas from collecting taxes for the year 1889 levied on Pullman cars operated in the state. The company refused to pay, on the ground that the state has no right to tax property used in interstate commerce. The case is now pending in the Supreme Court at Washington.

Attorney-General Miller has appointed Charles H. Aldrich, of Chicago, special Assistant Attorney of the Department of Justice, to have charge of suits to be instituted against a number of subsidized railroad companies under the provisions of the Act of Aug. 7, 1888, for failure to comply with requirements of the laws under which they were chartered in respect to the maintenance and operation of separate telegraph lines, and in respect to reporting to the Interstate Commerce Commission. Suit has already been instituted at Omaha under this law against the Union Pacific.

Notes from India.

A passenger train on the East Indian Railway was derailed at Hathras Oct. 28 by a misplaced switch, killing 10 people and injuring 35. The train ran over a facing-point switch, and into some buffer blocks at the end of a side track. It is said that the rate of speed was only 10 miles an hour, but the engineer did not discover the error until within 30 ft. of the buffers, although he had been running on the side track several hundred feet.

Coal has been discovered in Cashmere, and it is expected that a wagon road will be built so as to make it available for the railroads of the Punjab, which now burn wood and coal brought from Bengal.

The Bengal Iron & Steel Co. is to take the Burrrakur Iron Works from the government. There are now a great many cast-iron sleepers imported from Europe which ought to be made by Indian iron works.

An item concerning the Howrah freight station of the East Indian Railroad states that the wheat traffic at that point has fallen off greatly during the past few years.

The Government has made borings for artesian wells in a number of places, but was successful in only one, that at Quetta, where a discharge of 15,000 gallons per hour was secured.

The Government has issued an order to the effect that rigid wheel bases have been found to be more dangerous than flexible ones, where there is superelevation of one rail or where the grade changes suddenly, or the track is

in imperfect condition, and the state railroads are, therefore, directed in making plans for new rolling stock to provide either for four-wheeled vehicles or for vehicles with a pair of bogie trucks.

The Furness Steamers at Baltimore.

It is currently reported that the Furness line of steamships will cease to run to Baltimore owing to some difference with the Baltimore & Ohio. The line will, it is said, be transferred to Newport News.

Street Railroads.

The Puyallup Valley Railroad Co. is negotiating for the right of way through the Puyallup Indian Reservation. It proposes to build a standard gauge road from Tacoma to Sumner, Wash., a distance of 15 miles, at a cost of probably \$150,000. It is expected to have the line completed by July 1, next. The motive power has not yet been selected, but it will probably be electricity. A consolidation may be effected with the Seattle & Tacoma electric road. Ezra Meeker, of Puyallup, is President, and G. W. McAllister, of Tacoma, is Secretary and Treasurer.

Railroad Men's Buildings.

On the 15th inst. a building was opened at West Albany for the use of the employees of the New York Central & Hudson River. The building cost \$9,000. There were 1,050 subscriptions to the building fund, ranging from 25 cents to \$2,000. There are now five buildings, and 14 rooms along the line of the New York Central devoted to the use of employees. At the opening of the West Albany building Mr. Depew made an address. He spoke of the great usefulness of buildings of this class, and of the fact that those opened along the line of the New York Central had been largely maintained by the men themselves. This element he considered particularly valuable in efforts of this kind.

American Railroad Officers for Uruguay.

On a new road in Uruguay, to be built by Baring Brothers, of London, a number of North American engineers and operating officers have been engaged. The Chicago, Burlington & Quincy loses several men, among whom are Mr. F. C. Smith, General Cashier, and his assistant, Mr. Thomas White; Mr. George C. Smith, Chief Engineer; Frank Lawler and Samuel Ballard, Resident Engineers in Iowa; Mr. George Baker, Engine Inspector, and author of a book on locomotive economy, and others.

Strikes.

A number of freight conductors on the Cascade Division of the Northern Pacific struck Dec. 8, because the company required them to give bonds. It appears that these men run trains on which passengers are carried, and that the bonds are chiefly for faithful cash returns, being the same kind as usually required of passenger conductors, but the reports state that one of the objections presented by the men is against the paragraph stipulating that damages done to the company's property shall be paid for. Freight traffic was partially suspended for a short time.

The conductors, brakemen and firemen on the Pratt Mines Division of the Tennessee Coal, Iron & Railroad Co. struck last week for an increase of pay, which was refused. The reports say that convict workmen were put in the places of the strikers. It is stated that the miners struck in sympathy with the trainmen. A convict as a conductor must be a curiosity.

A Coal Storage Yard.

The Central Railroad of New Jersey, has contracted with the Dodge Coal Storage Co., of Philadelphia, to have an extensive coal storage yard laid out at Hampton, N. J., 17 miles east of Phillipsburg, to afford a place to store the immense amount of coal, which is continually lying along the line in cars. The coal will be raised from the pockets up an incline, and will be emptied at the lowest point first, so that there will be no necessity of running the coal to the top and dumping it, by which process a great loss is entailed by breakage of the coal. Scoops worked by steam and operated after the manner of an endless chain will be employed to raise coal from the storage yard back into the cars. The yard is expected to be completed by April 1. Its capacity will be 180,000 tons.

TECHNICAL.

Specifications for Steel for Fire-Boxes and Boilers.

Messrs. Carnegie, Phipps & Co. publish the following abstracts of leading specifications under which they are now working:

United States Navy—Shell: Tensile, 58,000 to 67,000 pounds; elongation, 22 per cent. in 8 in. transverse section, 25 per cent. in 8 in. longitudinal section. Flange: Tensile, 50,000 to 58,000 pounds; elongation, 20 per cent. in 8 in. Chemical requirements: Phosphorus, not over .035 per cent.; sulphur, not over .040 per cent. Cold-bending test: Specimen to stand being bent flat on itself. Quenching test: Steel heated to cherry red, plunged in water 82 deg. F., and to be bent around curve 1 1/2 times thickness of the plate.

British Admiralty—Tensile, 58,240 to 67,200 lbs.; elongation in 8 in., 20 per cent.; same cold-bending and quenching tests as U. S. Navy.

Bureau Veritas—Shell: Tensile, not less than 60,480 lbs.; elongation in 8 in., 20 per cent.; must withstand, after heating to dull red and being plunged into water of 82 deg. F., being bent until opening between ends is three times thickness of the plate.

United States Marine—Tensile, not less than 60,000 lbs.; reduction of area, 50 per cent.

American Boiler Makers' Association.—Tensile, 55,000 to 65,000 pounds; elongation, in 8 in., 20 per cent. for plates 3/8 in. thick, and under; 22 per cent. for plates, 3/4 in. to 1 1/2 in.; 25 per cent. for plates 1 1/2 in. and over. Cold-bending test: For plates 1 1/2 in. thick and under, specimen must bend back on itself without fracture; for plates over 1 1/2 in. thick, specimen must withstand bending 180 degrees around a mandrel, one and one-half times the thickness of the plate. Chemical requirements: Phosphorus, not over .040 per cent.; sulphur, not over .030 per cent.

Activity in Locomotive Building.
Some indication of the condition of the locomotive manufacturing business may be learned from the results of calls for bids for locomotives for the Lake Street elevated road, Chicago. It seems that some difficulty was found in obtaining locomotives on the desired dates. It was found that of six locomotive works, two were too full of work to make bids; two could not furnish locomotives until May, 1890; one could furnish some in April; and only one could furnish two in January, two in February, and six in March.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

On many of the freight cars now being built the foundation brake gear is being arranged on the plan recommended by the committee at the last Master Car Builders' Convention. The necessity for this cannot be too strongly urged upon master car builders. There is no possibility of getting good results in braking fast and heavy trains without the use of a stronger and better arranged gear than has been in use heretofore. In this issue will be noticed designs for foundation gear for ore, flat and box cars on the Chicago & Northwestern, designed by the Westinghouse Air Brake Company. This gear has been carefully arranged to meet all conditions, and it promises to give satisfactory results. Of course, many designs of car will require modifications of brake rigging to suit their peculiarities, but in a general way the dimensions given in the illustrations will answer for a majority of the common styles of freight cars, and it is advisable to thoroughly review the dimensions there given as well as the arrangement of the parts before adopting any brake foundation gear for cars now being built.

The freight traffic of the Louisville & Nashville for two years past shows in marked degree the influences to which railroad business is subject. The result may be summed up by saying that tonnage and train loads increased, but rates and length of haul decreased, and that the loss from the latter causes prevented the gain which should have arisen from the former. The tonnage carried was 14,444,000, as against 12,172,000 the previous year; a gain of 18½ per cent. The average haul, however, fell from 81.9 miles to 74.6, a decrease of nine per cent.; so that the ton-mileage only increased (eight) per cent. Meantime the ton-mile rate had diminished from 1.1 cents (not 1.06, as erroneously stated) to 1.0 cents; so that the actual freight receipts show a diminution of nearly two per cent. To balance this we have very great improvements in train economy. The increased tonnage was handled with a freight train mileage actually less than the previous year, so that the receipts per train mile fell but slightly. The average train load increased from 149½ tons to 159½, or seven per cent.; which gain was accomplished partly by a slight increase in the number of cars in the trains, but still more by an increase in the average load per car from 11.6 tons to 12.1. This last is perhaps the most remarkable result in the whole series, and it would be interesting to know more of the details by which it was brought about. It would also be worth knowing whether this increase in car loads was accompanied by any diminution in rapidity of car movement; in other words, whether the road made correspondingly increased use of its cars per day as well as per mile.

Legislation for the Safety of Trainmen.

The question whether or not the general government shall undertake to protect trainmen from death and injury is likely soon to pass out of the field of abstract discussion. It is highly probable that a bill will be passed by the present Congress requiring freight cars

engaged in interstate commerce to be equipped with continuous brakes and automatic couplers. The Interstate Commerce Commission has had this subject under consideration and will, we believe, make it prominent in its annual report. The President has recommended the subject to the attention of Congress. A strong public opinion in favor of national and state action to secure the greater safety of employés has been created, largely by the self-imposed and disinterested labors of one man. A bill intended to accomplish this end is sure to be introduced, and while there is so much to impel Congressmen to vote for it, there is little to prevent them. Popularity and votes are to be got by supporting such a bill; neither can be gained by opposing it.

There is little doubt that there will be such a law. Moreover, if reasonable and practicable, it will be welcomed by many operating officers. They feel quite as strongly as any one else in the community the humane considerations which enter into the question, and they realize, far better than any one else, the advantages and the ultimate economies of safety appliances. Most of the higher operating officers are agreed, certainly those on roads of heavy traffic are, that money can be made by the use of power brakes, vertical-plane, close couplers, block signals and interlocking. This proposition hardly needs demonstration. It demonstrates itself on every line where frequent trains are to be moved. Its truth, however, is not always apparent to those who control the finances of railroads. Therefore many officers of operating departments will be glad to have the law of the land behind them when they ask for air brakes and automatic couplers on freight trains. They would like also to have such help in getting block signals, interlocking and other appliances which conduce to speed, safety and economy.

The state of the case being as it is, it is hardly worth while to stop to discuss the necessity for, or the wisdom of, national legislation controlling the policy of the railroads in technical matters. But we do not care to let this occasion pass without repeating what we have often said before, that, for many and grave reasons, we shall profoundly regret the entrance of the government into the field of railroad operation. We do not believe that permanent advantage ever has been gained, or can be gained, by laws made to regulate technical practice on railroads. But, as matters now stand, we need not concern ourselves with general principles. The law seems to be inevitable, and the important thing to consider is how it may be made to produce the greatest good and the least harm. The action of Congress will probably be quickly followed by similar action in the state legislatures. The state commissioners have put themselves in harmony with the Interstate Commissioners in this matter, and they will have great influence in molding state legislation to conform to a national law. Whatever provisions Congress may make, therefore, for safety appliances on cars engaged in interstate traffic will be quickly applied to other cars as well. Thus the law will affect all roads and all equipment. Therefore, it is of the greatest importance that railroad officers should use their influence to make the law workable and not unduly burdensome. There is a disposition on the part of those who will have most to do with framing the law to avail themselves of the knowledge and judgment of railroad officers. It is their desire that the law should be recognized as moderate, just and practicable. Some of them realize how complicated the matter is, and the measure of responsibility they assume. They wish the advice of railroad officers, and should have it.

It is not likely that the law will be framed to cover many appliances. So far as we can judge, it will prescribe the use of driver brakes, automatic train brakes and automatic couplers. Certainly this is sufficient scope for the first law of the kind, and even if it is limited to these three things much judgment and knowledge will be needed to make the law effective and not too burdensome.

A very serious consideration with the framers of the bill must be the method of defining or limiting the kinds of brakes and couplers to be used. Of the driver brake it seems enough to say that it must be a power brake, either steam, air or vacuum, and leave all other details to be settled by the railroad companies. An attempt to do anything further would lead at once into complicated mechanical questions which are still open to discussion.

A few simple but positive conditions must be laid down for the train brake. The British Board of Trade requires that the brake should be (1) efficient in stopping trains, (2) instantaneous in action, (3) capable of application by engine driver or guard, (4) instantaneously self-acting in case of accident, (5) to be put on and taken off with facility on the engine and every

vehicle, (6) to be regularly used in daily working, and finally, (7) the material to be of durable character. These conditions are all essential, and should be stated in unmistakable language. They cover a good deal, and applied strictly will at once eliminate from consideration by the companies most of the devices offered. Further, it might be well to prescribe definitely the maximum time allowable for full application of the brakes, with a train of given length, and also to prescribe some measure of the minimum power deliverable at the brake shoe under stated conditions. These are refinements to be considered with the advice of experts and railroad officers; the first two conditions of the Board of Trade requirements cover them in general terms.

These conditions would leave the roads free to use any one of several brakes more or less efficient; but one further condition, quite as essential as any, is that cars to run in freight service should be as freely interchangeable as they now are, and yet the efficiency of the power brake apparatus must not be impaired. That is, whatever brake is adopted, it must work in the same train with the typical, standard brake of the country. Circumstances have already settled that standard type. It is the continuous, automatic air brake. We think there is no doubt that the air brake now in common use on the railroads of the United States is the most perfect and efficient brake yet brought to the knowledge of the world. This brake is the one certain to be widely used whatever laws are or are not made. To that extent, therefore, it fixes the limits of the law, which must require that the brakes adopted shall not only fill the conditions laid down above, but shall interchange with the Westinghouse.

For the coupler, the law may with perfect propriety require the use of the Master Car-Builders' coupler, for there are enough varieties of that type now in the field to insure competition. Indeed, to be operative, the law must prescribe a coupler that will work with the Master Car-Builders' coupler. That coupler is the standard settled upon after long study and experiment, and is now fast being introduced, and any action which should reopen the coupler question would defeat itself.

When the framers of the law have settled the conditions to be fulfilled by the various appliances, they will still have left the more difficult problem of fixing the time when equipment with them must begin, and must be completed. The vast expenditure involved in the proposed changes necessitates the greatest caution. We may assume that there are to-day 900,000 freight cars in the United States not equipped with automatic brakes and couplers. To equip them with both will cost about \$72,000,000. Probably, the number of cars unequipped is still greater than this. A further expenditure of \$5,000,000 or \$6,000,000, at least, will be necessary to equip engines with the air-brake apparatus, and of, say, \$5,000,000 or \$6,000,000 to put on driver brakes. The companies will have, therefore, to face an expenditure of over \$80,000,000, or more than the total dividends paid on all railroad stock in the United States in the fiscal year 1888, according to Poor's Manual. How to distribute this expenditure, so that it will not bankrupt roads barely paying fixed charges, and will not oppress more prosperous roads, and to still accomplish the object of the law, is the hardest part of the problem which Congress has to solve.

It is suggested that all new cars, whether additions to equipment or renewals of stock, should be equipped with the prescribed brakes and couplers. This would make the equipment complete in, say, 12 years. It has been suggested also that a certain percentage of all freight stock should be equipped each year, and that after a specified time no trains should be run in interstate traffic without sufficient air-braked cars in them to control them. Consideration of this part of the problem we shall leave to a future issue, but meanwhile we suggest that it is highly desirable that there should be a conference of higher railroad officers to agree upon such provisions as they care to recommend for incorporation in the bill. We are confident that their suggestions would be welcomed, and would have great influence in giving definite form to the law.

Some of the Problems of the Compound.

Two correspondents raise questions as to some of the problems that will come up with the use of compound locomotives of the Worsdell-Von Borries type.

In regard to the steaming of the two-cylinder compound, the best evidence which we possess that the results are good is in the experience of the English locomotive builders, particularly Beyer, Peacock & Co., who have built many large two-cylinder compounds for the colonies, which work under difficulties as great

as those which confront the American locomotives. And again, the Saxony State roads, although fearing that the steaming power of the two-cylinder compound would be inferior, have found in actual service that the gain in economy of the engines has reduced the necessity for excessive draft on the fires. Theory does not take kindly to this subject, therefore we refrain from further comment.

It is true that the heaviest work done by the American locomotive is on the steepest grades; but it is also true that the average American engines meet the greatest resistance in starting heavy trains from stations. Still, the largest amount of steam is required for the longest time when the engine is hauling a train up a considerable grade at a good speed. It is at such times that the fires are hardest to keep up. The compound principle for locomotives will be most valuable as a means of increasing the economy when the locomotive is called upon to do its heaviest work, therefore it naturally follows that its value on grades will be greater than on levels. This is almost contrary to the conclusions of our correspondent, notwithstanding.

The statements made by our correspondent with reference to the effect of the present designs of locomotives upon permanent way can be relied upon. However, when three cylinders are used, with cranks at 120 degrees, there are some features which he may have overlooked. If the cranks are placed at an angle of 120 degrees with each other, as shown in fig. 1 at A, B and C, then, when one of the outside

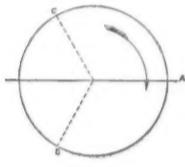


Fig. 1.

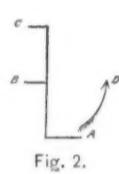


Fig. 2.

cranks is approaching or leaving the dead point—which is the position where the inertia of the reciprocating parts is at a maximum—the other outside crank will be at 60 degrees from the other dead point. As in those positions the inertia of the two outside sets of reciprocating parts will be different in amount and will act in opposite directions, they will not balance each other, but rather add to the detrimental effect of each other's action. This may, perhaps, be more plainly seen by reference to the figures. Let one outside crank be at A and the other at C, figs. 1 and 2. Let the rotation of the cranks be in the direction of the arrow in fig. 1. Then the inertia of the parts connected to the crank pin A, which are being brought to rest relative to the engine, will pull in one direction; those parts connected to C on the other side are being started into motion, and will pull on C in the other direction. Now, if these cranks were lying in the same vertical longitudinal plane, as in the case of the "Shaw" locomotive or other engines having two cranks on the same side of the engine, then the effect of these two opposite forces, as shown by the arrows, would be to balance each other. But, as they are on opposite sides of the centre of the engine, they combine to rotate the whole machine in the direction of the arrow D, and thereby cause nosing, even to a greater degree than if the cranks were at 90 degrees with each other. In any position the inertia of the reciprocating parts attached to the middle crank has no effect on the rotation of the engine in a horizontal plane, and therefore in no case could that crank either cause or reduce nosing. With regard to the forward and backward movement of the engine—called "galloping"—placing cranks at 120 degrees is a decided advantage, because when one crank is on a dead point, and the inertia of the reciprocating parts attached thereto is at a maximum, then the inertia of the parts attached to the other two cranks combine to neutralize the effect of the first in a direction with the length of the engine. The galloping of the engine is, of course, undesirable, and any change which will reduce it, and not at the same time increase other objectionable actions, is to be welcomed; but placing three cranks at 120 degrees increases the nosing of the engine, which is the most objectionable motion, while it reduces the galloping, which is the least objectionable.

As each side crank and set of reciprocating parts must be balanced by themselves under the conditions of locomotive design, unless they lie in practically the same longitudinal line as another crank or set of reciprocating parts, they will require but little, if any, more or less counterbalance to accomplish that end, whatever be the crank angles, provided they be over 90 degrees apart. If they are less than 90 degrees apart, then the inertia of the reciprocating part attached thereto tends in the same direction, and they do

COMPARATIVE WEIGHTS OF RECIPROCATING PARTS OF LOCOMOTIVES.									
Lbs.	Type of piston and piston rod.	Type of piston.	Material of piston rod.	Material of piston head.	Thickness of piston.	Lbs.	Type of cross-head.	Material of cross-head.	Lbs.
276	Solid.	Steel	Cast-iron.		6	177	Top and bottom bar	Cast steel.	453
287	Follower	Iron.	"		5	197	" Dean."	"	2.70
272	"	Steel	"		4½	155	4-bar guide.	Cast iron.	484
272	"	"	"		4½	143		Cast steel.	2.88
284	Solid.	Iron	"		4	261	Top and bottom bar	"	427
305	"	Steel	"		5	191	4-bar guide.	"	2.54
292	"	"	"		4¾	187		"	415
315	Follower	"	"		5¾	164	"	"	545
146	Solid.	"	Cast-steel.	{ 5/8 in. (about)	22	{ For inside connected locomotives.			496
									479
									479
									1.00
									London, Brighton & South Coast.

By whom used.

not combine to increase nosing, but to increase galloping; and therefore, they can be partially or wholly balanced by a centre crank—wholly if coincident, and only partially if at an angle with each other. In marine and stationary engines, where the nosing is in most cases less objectionable than the galloping, there is considerable advantage in placing the cranks at 120 degrees. In addition to the reduction of the galloping in such cases, the turning moment on the cranks is made more uniform by placing the cranks at 120 degrees. This advantage is quite as great in the case of locomotives as with stationary or marine engines, but that desirable feature of such a crank angle is not being considered here.

The problem of counterbalancing locomotives by the use of multiple cylinders and new crank angles has been well studied by the Chief Engineer, M. Henry, and his assistant, M. Baudry, of the Paris, Lyons & Mediterranean Railroad of France. The result of their studies is a conclusion that four cylinders must be used; the two lying adjacent on each side to have their cranks at an angle approaching 180 degrees. With this arrangement a better balancing than with the ordinary arrangement was found to be possible; but the large number of parts necessitated by this arrangement rather block the way for an extended use of the designs on the road mentioned.

There is still another method of reducing the action of counterbalance upon the rails at a given speed of train. It is by increasing the diameter of the drivers. A not unreasonable increase makes a vast difference in the effect on the rail. Let an actual case be taken where a driving wheel is changed from 5 ft. to 6 ft. in

to reduce the trouble that is now present with our locomotive counterbalancing at high speeds to an amount that would be acceptable in a high degree. It would seem that before there are radical changes made in the designs of locomotives, in order to reduce the effect of the counterbalance on the rails, the best possible results ought to be obtained from the class of designs that are now almost standard by a rational change in dimensions of parts.

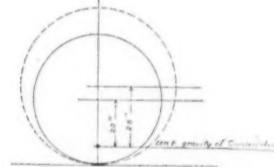
In continuation of this subject the table of comparative weights of a portion of the reciprocating parts of various 18-in. express locomotives may prove interesting and throw some light upon one method of reducing the effect of locomotive counterbalances on the track. This method lies in the direction of reducing the weight of the reciprocating parts to a minimum. It will be noticed that the English engine mentioned has very light reciprocating parts, and, further, it will be remembered that such engines have larger wheels, and therefore that the smaller balance required has also less centrifugal force, because of the reduced number of revolutions per minute at a given speed. Even if an objection be offered that the English construction is too weak for the American engine, yet there will remain, after allowing for the objection, a considerable balance in favor of the English engine in point of weight of reciprocating parts. Our own engines differ in this respect more than is necessary, and it may be safely assumed that the weights given in the table do not represent either the maximum or the minimum, and therefore that the variation is even greater than the table indicates. There is but little doubt that the weights of the reciprocating parts of our locomotives could be reduced at least 40 per cent., and in some cases 50 per cent., without loss of strength, and with great gain in smoothness of action of the locomotives and in the life of the tracks.

The Uniform Code as a Standard.

A correspondent, "S. H. M.," writes as follows:

In discussing the experience of the Erie road with rule 8 of the Uniform Code, and in your editorial comment on the New York Central's rule for keeping trains five minutes apart, both of which appear in the *Railroad Gazette* Nov. 29, and one of which, the spacing rule, you have discussed two or three times lately, you open up a question as to the value of the standard code as a whole. It would appear that with all its alleged merits this code has grave faults, and, presumably, has an untold number of features which may be anything but unqualified advantages to a road now working under rules of its own making. Although you agree with the Erie in condemning rule 8, and with the New York railroad commissioners in believing a 10-minute interval necessary, I must say that the impression I had got from articles on the code during the last two or three years was that you accorded it unqualified approval. You certainly have used highly commendatory phrases in connection with the Time Convention and its committees, and have seemed to imply that they could do no wrong. My position is now therefore somewhat perplexed. Can you give me any aid in clearing up my doubts? If this assembled wisdom of all the railroads in the United States cannot give us a solid basis upon which to work, what are we coming to?

The standard code is notable chiefly for the simplicity and directness of its language, the uniformity of its style and the logical arrangement of subjects. As compared with nearly all other codes worthy of comparison with it, it is noteworthy for its omission of non-essentials. Individual codes have been compiled by such poor hands, or, when they embodied work good in itself, have been so carelessly put together, that they have mostly become absolutely "below grade." As literary productions they are not to be compared with the work of a very ordinary superintendent. One of the greatest faults of managers in this direction has been that of using codes which a half dozen of their predecessors had pasted together, using material from a great many sources. An appreciation of these points will at once make clear the fact that the standard



diameter. (See diagram.) The dotted lines show the 6-ft. wheel, the full lines the 5-ft. wheel. The distance of the centre of gravity of the counterbalance from the rail will be almost precisely the same in both cases. In the case of the 5-ft. wheel it is about 20 in., and in the case of the 6-ft. wheel it will be about 26 in. Let the weight of the reciprocating parts be about 400 lbs., including a portion of the main rod. Then the weight of the balance needed to fully counterbalance the reciprocating parts in both cases will be, if the stroke is

$$\frac{400 \times 12}{12 \text{ in.}} = 240 \text{ lbs. for a 5-ft. wheel, and}$$

$$\frac{400 \times 12}{20} = 184 \text{ lbs. for a 6-ft. wheel. This gives a}$$

reduction in the weight of the balance of 56 lbs., or about 23 per cent. in favor of the 6-ft. wheel.

The centrifugal force of this balance, which is one measure of the detrimental effect of the balance on the rail, is dependent upon the revolutions per minute of the wheels, and these revolutions are as follows at 60 miles per hour: For a 5-ft. wheel, 336 revolutions per minute; for a 6-ft. wheel, 281 revolutions per minute. The centrifugal force of the counterbalance at the speed of 60 miles per hour is, in the 5-ft. wheel, 14,900 lbs.; in the 6-ft. wheel, 10,390 lbs. This shows a difference of about 30 per cent. in favor of the 6-ft. wheel. That is, an increase in the diameter of the driving wheel of one foot decreases the effect on the rail about 30 per cent. If to this decrease were to be added that which can be obtained by a reduction of the weights of the reciprocating parts, then the total would be nearly 60 per cent., which is fully sufficient

code has many points of superiority, even if its rules be not all perfect practically.

Next it is to be remembered that railroad superintendents are among the most self-reliant people in the world. They say so themselves. Until a comparatively recent date it was generally true to say that each had grown up in the centre of a small kingdom of his own; his neighbors were all remote physically, and often their ideas were still further remote, so far as could be judged from any recognition accorded them. The effects of this state of things are not by any means exhausted. It, therefore, becomes necessary in a code for general use to leave out many ideas which many members of the convention would like to include, and to make many rules brief where large numbers of members were perfectly ready to make them more full and explicit.

The *Railroad Gazette*, therefore, has commended the spirit of the Time Convention and its committee, making mention of the great advance marked by even imperfect work in this line, as compared with the condition formerly existing. In the mere matter of getting the consensus of opinion and pointing out the great faults of time-tables got up by old methods, the convention did a great and difficult work. The problem is so large and so complicated that even a moderate degree of progress is to be regarded as highly satisfactory. We think careful readers of these columns will agree that this has been the uppermost motive apparent in our criticisms. The difficult nature of the work may be partially appreciated by reference to any one of a score of the rules. Many separate articles, each embracing discussion and criticism of a single rule, have appeared in these columns, both from contributors and editorially. We received the other day from a well-known superintendent an interesting criticism of one of the simplest rules of the book. The discussions in the convention, as well as those in the committee, which often took up several hours on one point, are further evidence in the same line.

We have a standard code, and it is greatly superior to all except a very few of those previously existing. It is an improvement probably on any individual code made before its appearance, without exception. But no superintendent is warranted in putting it in use without making sure that it is at least equally safe with his former rules nor without carefully studying it on general principles; and, last but not least, the merit of the code is especially shown in the facility with which individual views of superintendents can be added to the rules or can be employed for amending them, without impairing the essential advantages of uniformity, as outlined at the beginning of this note.

Looking Backward: 1889-1869.

The Louisville & Nashville Railroad was one of the pioneers in introducing a good system of annual reports. Its classified statistics of operating expenses go so far back as to give an illustration of some important points in American railroad history for many years past.

Take the expense of maintenance of way: Twenty years ago the expenditure from this cause on the main stem was almost exactly the same per mile that it now is. Apparently it was a little greater, actually (owing to the currency standard) somewhat less. In the meantime the volume of traffic has so far increased that the expense per train-mile, which more accurately represents the real cost to the railroad and the public, has diminished to one-third its old figure. The results are as follows:

	Cost of maintenance of way.	
	Per train-mile.	Cents.
Per mile.		
1866-7	\$881	28
1867-8	867	28 $\frac{1}{2}$
1868-9	888	27 $\frac{3}{4}$
	Cents.	
1886-7	\$809	9 $\frac{1}{2}$
1887-8	849	9 $\frac{1}{2}$
1888-9	829	9

But these changes have not been the result of a gradual process of development. On the contrary, they have come by fits and starts, and have gone to extremes from which the present condition only represents a normal reaction. The stages have been as follows:

1869-71. Growth of traffic beyond the capacity of old roadbed. Repairs increase *faster* than train-mileage, so that additional traffic produces no economy. Maintenance expenses for 1870-71 are, per mile, \$1,657; per train-mile, 31 cents.

1871-80. Introduction of steel rails. During the early stages of the process, maintenance expenses become temporarily increased, reaching a maximum in 1873-4 of \$1,940 per mile and 37 $\frac{1}{2}$ cents per train-mile. Thence there is a steady diminution in expense per mile which, combined with the growth of traffic, makes a rapid reduction in cost per train-mile. Figures for 1878-9 are, per mile, \$904; per train-mile, 14 cents; for 1879-80, per mile, \$775; per train-mile, 11 $\frac{1}{4}$ cents.

1880-82. The track having been so recently put in first-class condition, the large and profitable traffic of this

period can be handled with unusually slight expenditures for maintenance. These are: 1880-81, per mile, \$495; per train-mile, 6 $\frac{1}{4}$ cents; 1881-82, per mile, \$438; per train-mile, 5 $\frac{1}{2}$ cents. Dividends, which during the previous period had been often passed, at this time become very large, rising as high as 12 per cent. on the *old* capitalization. The Louisville & Nashville does not stand alone in this respect; a large number of railroads share the same movement.

1882-83. People begin to see that repairs for the two years past have been exceptionally low, and that dividends have been higher than can be permanently maintained. In this year repairs cost \$801 per mile, and 10 $\frac{1}{2}$ cents per train-mile.

1883-86. The reaction from the inflation of 1881, aggravated as it is by the construction of new roads invited by the high temporary dividend rate of that year, so reduces earnings that it is hard for the system to do more than make the necessary repairs, without counting them on too liberal a scale. The charges vary from \$500 to \$651 per mile, and 7 to 8 $\frac{1}{4}$ cents per train-mile. Finally, the renewal of prosperity in 1886 enables these expenses to be restored to their normal figure.

It would be hard to find a better epitome of twenty years' railroad history than these statistics present.

Franklin B. Gowen.

The railroad career of Mr. Gowen was that of a good general in a bad cause. Personally he stood at the very head of the railroad men of his time. His abilities were most brilliant; his integrity was unquestioned; his courage, as shown by personal contempt of danger in his contest with the Molly Maguires, was of the rarest order. His personal influence, was such that failures and losses could hardly shake it. The unsuccessful issue of his work only shows how little power even the ablest of men has to stem the tide of events. Had he identified himself with the extension and consolidation of railroad business, pure and simple, there is no telling what he might have accomplished. But he attempted to unite the business of production with that of transportation. He represented a theory that a railroad should furnish a great deal of its own freight. He had been a coal man long before he became a railroad man; and in his capacity of railroad president he was quite as solicitous to extend the business of mining as that of transportation.

Several causes worked powerfully against him. The worst thing was that he bought so much land at inflated prices. Never have land values, in the East at any rate, been so inflated as they were just before the crisis of 1873. The result was an artificial capitalization of the whole system. But this was not all. The purchases were made for the most part by the aid of bond issues, negotiated at the high rates of interest then prevailing. There was thus a heavy interest charge on an already inflated principal. The fall in land values prevented any return to old conditions; the fall in prices made the burden all the harder to bear. Even when general business recovered, as it did in 1880 and 1881, it did not return to the conditions on which the values of 1873 had been based.

These were the immediate reasons for the failure of Mr. Gowen's project. But looking at it from a wider public standpoint, there were more fundamental reasons why it ought to fail. The union of producers' and carriers' interests is one which involves dangers wholly out of proportion to the benefits which it promises. In this respect it differs from consolidation of railroads with one another. Even in the latter case there is a chance that the monopoly power may be abused; but the economy which arises from the combination of local railroads into a through line is so great that it many times outweighs the danger. In the combination of carriers and producers there is no such resulting economy. Experience indicates that outside business is on the whole quite as well done by other agencies as by railroad corporations. The union of the different interests simply opens the door for abuse. No one believed that Mr. Gowen was actuated by corrupt purposes in any of his efforts; but it is none the less true that the policy with which he was identified would in the long run have tended toward discrimination between shippers, and, in the hands of a man less upright than himself it would furnish every facility for corrupt management on the part of directors. It is noteworthy that, since his retirement from the Reading presidency, he has acted as champion of those very interests which his policy of combination between producer and carrier would have endangered.

The amount of cash "knocked down" by passenger conductors is said by well-posted managers to amount to hundreds of thousands of dollars annually, and it is not to be doubted that they have data which gives some support to a statement of this kind; but with most people the question could be more intelligently considered if actual figures were available as a basis to start from. Few roads, so far as we are aware, publish their passenger earnings in a shape enabling a comparison to be made between ticket sales and cash fares, or between the cash fares of the different divisions for different periods. Quite likely in many cases the record of cash collections shows such remarkable fluctuations and contrasts that the idea of publishing the figures would give the superintendent the "cold shivers"; but an evil, either small or great, must be recognized before

it can be cured or extirpated, and it would therefore be well perhaps if more statistics of this kind were published. The East Tennessee, Virginia & Georgia does so publish its passenger earnings, and we give the figures below for the year ending June 30, 1889:

Passenger earnings.		
	Gross earn.	Collected in cash by conductors.
East Tennessee division	\$764,168	\$14,700
Alabama division	254,716	11,703
Georgia division	234,697	16,772
		\$86,175
	\$1,233,581	

The conductors' collections amount to 4.36 per cent. of the total. The total passenger earnings of the country for a year, as found in "Poor's Manual" (1889), are 251 millions of dollars, of which 4.36 per cent. would be nearly eleven millions, which may be regarded as a rough approximation to the amount collected by conductors annually. The superintendent who said stealings amounted to "millions," doubtless referred to a term of years, not to a single twelve-month; but it appears to be unnecessary to assume that he meant a very long term. Certainly, when we consider the other methods of cheating the company which may be practiced, added to the large numbers of fares and tickets which escape collection, whether the conductor be honest or otherwise, the leak in the passenger revenue of the country may well be regarded as gigantic.

The effort of the Canadian Pacific to close the Emerson branch during the winter is arousing some local opposition. This branch runs southward from Winnipeg. It is on the whole rather unprofitable; but as the company got it ready-made from the government for nothing, and received a land grant besides, the people think that it ought to be kept running through the year if it will pay operating expenses, taking good and bad months together. To American readers this incident is chiefly interesting as showing the kind of antagonism which the company is likely to arouse from local shippers, which will probably in the long run result in subjecting it to restrictions not unlike those of the short-haul clause of the Interstate Commerce law. As long as the Canadian Pacific can make much lower rates for through traffic than for local, it has an advantage over its American rivals. When the local shippers begin to protest against such disparity, this advantage will diminish. Something of the sort has already begun. The people of certain parts of British Columbia are as much in earnest against local discrimination as those of many of our own states, and it would take but little more popular feeling in this and other districts to make the Canadian authorities undertake stricter control. The monopoly of the company has already been voluntarily surrendered on account of the odium which it caused. It is doubtful whether immunity from legislative restriction can last much longer than immunity from competition.

The first appeal to the Inter-state Commerce Commission on the subject of unjust discrimination in the collection of car detention charges comes from Cincinnati, where the grain dealers have complained against the Car Service Bureau of that city because fruit and vegetable dealers are given five days in which to unload their cars instead of two days, the time allowed other people. It is, perhaps, well to have this question come before the Commission, so that the matter may be fully investigated by that body, and a clear statement of the principles involved in collecting such charges elicited. There can be little doubt that some kinds of traffic will bear greater detention charges than other kinds, and the principle of charging what the traffic will bear cannot be ignored here any more than in the making of transportation rates proper; but whether the Commission can formulate a set of rules which shall be generally applicable, even to a small part of the varying conditions to be met, is by no means clear.

Evergreen trees are to be employed on the Philadelphia & Reading as markers to indicate the location of switches and crossings where flangers must be lifted. In regions where evergreen trees are plenty, and unless care is taken to clear away misleading trees, and to replace those which die out, this plan might not work very well. For instance, the man in charge of the flanger might find indications requiring lifting the apparatus so frequently that he might as well keep it up altogether, and let his helpers sit down and smoke; but where the conditions will admit, this is certainly an improvement on a post with a rude cross nailed to it. This latter device gives an aspect of cheapness to the best equipped railroad. The trees will certainly tend to cultivate the aesthetic nature of the trackmen, and will, therefore, be an aid to Burdette, and the others who are working to that end, and so, of course, "fill a long-felt want."

Mr. J. B. Maxom, formerly Superintendent of the Middle Iowa Division of the Chicago, Burlington & Quincy, has been appointed Inspector of Stations. His duty is to go from point to point on the line and collect all superfluous material and send it in to headquarters to be redistributed. The title is somewhat misleading, as this term generally means a traveling auditor to inspect agents' cash accounts, or else an officer who looks after the conduct of station men generally. In spite of the admirable and close management of the Burlington

road, there has been collected a great number of tools which were found unnecessary at various points. This careful review of stock carried is in direct line with the present policy of the officers, which is to reduce, as far as possible, all stock carried and all unnecessary expense in every department.

The railroads centering in Indianapolis have formed the Indiana Car Association, which will administer the car detention bureaus at all junction points within a radius of 100 miles of that city. There are 21 roads represented, and the number of junction points is 53. The manager of the association is to receive \$2,500 a year, and his chief clerk \$1,500. There will be 18 assistants at not over \$75 each per month. At the conference for forming this association it was stated that the Chicago Car Service Association employs 38 men, and costs the roads \$75 each per month. The satisfaction of shippers and consignees with the administration of the association in Chicago was reasserted. It appears that potato and apple dealers continue to make storehouses of cars in that city, and that the regular dealers have petitioned to have the charge per car increased to \$5 a day.

It is stated by railroad men who have recently been traveling in Mexico that the metal ties used on the Mexican railroads are quite satisfactory. They are made of channel form and placed upon a gravel foundation. Careful observation of the riding of the train on track laid on wooden and metal ties under the same conditions showed that there was even less noise over the metal ties than over the wooden ones, and that when running off of the wooden ties on to the metal ones there was a perceptible increase in smoothness and decrease in noise.

TECHNICAL.

Locomotive Building.

The Philadelphia & Reading has ordered 10 shunting and 10 passenger locomotives, to be delivered by Jan. 10.

The Illinois Central is having 20 moguls built at the Schenectady Locomotive Works, a number of which have already been received. The company will probably soon let contracts for a number of new engines.

The Jacksonville Southeastern has just received a new locomotive from the Baldwin Locomotive Works of Philadelphia, Pa.

The New York, Ontario & Western is having six mogul locomotives built by the New York Locomotive Works, Rome, N. Y., which are to be equipped with the Beal's driver brake.

The Brooks Locomotive Works have received a second order for 15 locomotives for the Cleveland, Cincinnati, Chicago & St. Louis. Of the former order there are still four ten-wheel and five switching engines not yet delivered.

The New York, Lake Erie & Western has recently put in service 12 heavy freight engines built by the Baldwin Locomotive Works.

The Chesapeake & Ohio is reported in the market for 20 ten-wheel engines.

The Pittsburgh Locomotive Co. is building 23 locomotives for the Pittsburgh & Western.

The St. Louis, Vandalia & Terre Haute has five engines under construction in the shops of the company.

The Richmond Locomotive & Machine Works, of Richmond, Va., are building ten 60-ton consolidation engines for the Richmond & Danville with 20 x 24 cylinders and two with 18 x 24 cylinders for the Seaboard Air Line, and the same number for the Chesapeake & Ohio. The latter engines will weigh 65 tons, and the former 48 tons. Four 40-ton 17 x 24 passenger locomotives are being built for the Atlantic & Danville. The company also has considerable government work under contract. A large amount of new machinery has been added, and several extensions to the works built. A new machine shop 100 x 100 has been completed and a new boiler shop 185 x 92 ft. is being erected. Nearly 500 men are now employed by the company.

Car Notes.

The Buffalo, Rochester & Pittsburgh will soon let contracts for building 1,500 new freight cars.

In addition to the 1,200 freight cars which the Ohio Falls Car Co. is to complete for the Central of Georgia, 23 passenger cars are also to be built. The passenger cars are to be equipped with the Westinghouse air brake and Janney couplers. They will cost about \$15,000 each.

The Central of New Jersey is having 25 passenger cars built at the works of the Pullman Co.

E. D. Smith & Co., 208 South Fourth street, Philadelphia, Pa., are in the market for 250 gondola cars of the Pennsylvania standard pattern.

The Litchfield Car & Machine Co., of Litchfield, Ill., is reported to have the contract for building 2,000 freight cars for the Cleveland, Cincinnati, St. Louis & Chicago.

The rolling stock for the Monterey & Mexican Gulf is constantly arriving. Last week the company received a lot of 50 platform cars, and 30 box and the same number of hand cars from firms in this country.

The St. Charles Car Co. has delivered 70 box cars to the Colorado Midland.

The Southern Express Co. has had several new express cars built by the Pullman Co. They have iron doors and several new improvements.

The Louisville, Evansville & St. Louis has just completed, at its shops in Huntingburg, Ind., the cars for two new trains to run between Louisville and St. Louis. They are equipped with the Timlin-Heidinger system of car heating.

The Ohio Valley road has 300 box and several refrigerator cars under contract.

The St. Louis, Alton & Terre Haute is having a new pay car built by the Litchfield Car & Machine Co.

Twenty-four new passenger cars have been recently added to the equipment of the Flint & Pere Marquette.

The Canadian Pacific has recently put in service several new colonist sleeping cars for transcontinental service, for the use of which a small extra charge is to be made.

The Chicago, Burlington & Quincy is building 300 furniture cars for service on its eastern lines.

The Iron Car Co., 120 Broadway, New York, is at present having cars built by the following companies: Allison Manufacturing Co., Philadelphia, Pa.; Bloomsburg Car Co., Bloomsburg, Pa.; Murray, Dougal & Co., Milton, Pa.; Harrisburg Car Manufacturing Co., Harrisburg, Pa.; Huntington Manufacturing Co., Huntington, Pa., and Lebanon Manufacturing Co., Lebanon, Pa.

The Huntington works were destroyed by fire last summer, and are now being rebuilt, being for the most part nearly completed.

The Indianapolis Car & Mfg. Co. is receiving yellow pine from the South at the rate of 100,000 ft. a day. The present year the company has used 22,000,000 ft. of yellow pine, 4,000,000 ft. of white pine and 6,000,000 ft. of oak timber. During the past year the works used 1,980,000 lbs. of merchant iron, not including nuts, washers and nails.

Bridge Notes.

The Pacific Bridge Co., of San Francisco, has been let the contract for building an iron bridge across Deer Creek, at Nevada City, Nev., for \$2,700. The bridge is to have a 60-ft. span.

The Jacksonville, Tampa & Key West is to construct 200 ft. of pile approaches and a wharf at Beresford Lake, Fla., for the transfer of freight from the St. John's River boats. The contract for the pile trestles will soon be let.

The Park Commission of New York City this week opened proposals for building a new draw span in the McComb's Dam Bridge. There were four bids, the lowest being \$9,700 from the King Iron Bridge & Manufacturing Co., of Cleveland, O., to which concern the contract was awarded.

The Phoenix Bridge Co. is said to have been awarded the contract for building the Pacific Short Line bridge over the Missouri River at Sioux City, Ia.

The New York & Greenwood Lake road has completed a bridge over Belleville avenue, Bloomfield, N. J.

The Knoxville Southern has completed a plan for the bridge over the Tennessee River at Knoxville, and will soon commence its erection.

The Chicago, Milwaukee & St. Paul has put in a new steel span in its bridge at La Crosse, Wis.

Surveys are being made for the proposed bridges over the Erie Canal and over the tracks of the New York Central and Hudson River and Genesee street road at Syracuse, N. Y. The work will probably cost about \$45,000.

The Chicago Bridge & Iron Co. has been awarded plans for building the iron bridge over the Colorado River at Bastrop, Tex. There were seven bids opened. The bridge will consist of one cantilever span of 332 ft. and two shorter spans of 150 ft. each, with about 650 ft. of wooden approaches.

The Philadelphia & Reading has nearly completed a seven span iron bridge at Muncy, Pa.

The American Bridge Co., of Roanoke, Va., has recently been awarded a large contract for work on the North Carolina extension of the Norfolk & Western. Several other large orders have been received, which will keep the company busy for some time. A new foundry 50 x 100 ft. is being built, and work is soon to be commenced on a smith and hammer shop 75 x 100 ft. An addition will also be made to the main building.

Work is nearly completed on the piers of the Ohio Connecting bridge, which is being built across the Ohio River at Brunots Island, below Pittsburgh, by the Pennsylvania. The superstructure will be commenced in a short time.

The City Engineer of Houston, Tex., is preparing estimates for the construction of two bridges, one across Buffalo River at the foot of Rusk Street, and the other across White Oak River at Crockett Street.

The heavy rains raised the river at Johnstown, Pa., to an unusual height last week, and the bridge across the Conemaugh at Woodvale and that at Lincoln Street were carried away.

Philips & Amerson, of Centreville, Ala., are interested in a projected bridge to be built across the Echeconne River at that place.

A bill has been introduced in the South Carolina Legislature to authorize Lexington County and the city of Columbia to issue \$50,000 of bonds to purchase the Broad River and Congaree bridges or erect others.

The Commissioners of Chester and Montgomery counties have under consideration a project to build a bridge over the Schuylkill River at Pottstown, Pa., at an estimated cost of \$25,000.

The iron work of the new Pennsylvania bridge across the Maumee River, in Toledo, O., is nearly all in place, excepting one span.

The contract for building the bridges over Muscatatuck and Sand Creek, Jennings County, Ind., has been awarded to the Massillon Bridge Co., Massillon, O., for \$5,839. The masonry has been awarded to Dixon & Brolley, of North Vernon, O.

Noah N. Tyner, H. H. Northrup and others have chartered the Oregon & Washington Bridge Co. to construct a bridge across the Columbia River from La Camas to the westerly shore of the Sandy River. The capital stock is \$300,000.

The Baltimore & Potomac Railroad and Anne Arundel County, Md., will jointly build an iron bridge across the Patuxent River near Woodwardville, Md.

The Canadian Bridge & Iron Co. has been incorporated at Montreal with a capital stock of \$75,000, for the construction of iron bridges, and the manufacture of iron work.

J. C. Sims, Bowling Green, Ky., will receive bids for building new iron bridge across Gasper Creek, near Hadley.

The contract for constructing an iron Pratt truss bridge, at Cumberland, Md., has been let to the Pittsburgh Bridge Co., of Pittsburgh, Pa.

The Smith Bridge Co., of Toledo, O., has the contract to build a new iron bridge across the Auglaize River at the Dayton & Michigan station. There were 17 bidders. The bridge, when finished, will cost about \$8,000.

The last span of the new iron bridge on the Philadelphia & Erie at Montgomery, Pa., has just been completed, and trains are now running over the bridge.

The bridge commissioners of Knox County, Ky., have issued the specifications for the proposed iron highway bridge over the Cumberland River at Barbourville, Ky. The bridge is to be 18 ft. wide in the clear, with one span of 240 ft. from centre to centre of abutment, and at right

angles to the stream. The bridge is to support a rolling load of 1,440 lbs. per lineal foot, and is to rest on two abutments of first-class bridge masonry, with wing walls supporting the earthwork. Specification and vertical section of the bridge site may be examined at the office of the bridge commissioners in Barbourville, Knox County, Ky. The bids will be opened Jan. 27.

Manufacturing and Business.

The Dunham Manufacturing Co. reports a number of large orders for its car door. Among the companies to which sales have recently been made are the Central of Georgia, Missouri Pacific, Atchison, Topeka & Santa Fe, Chicago, Burlington & Northern, Kansas City, Fort Scott & Memphis, Atlanta & West Point, Western & Atlantic, Kansas City, St. Joseph & Council Bluffs and the American Live Stock Transportation Co.

The Dodson Safety Nut Lock Co. has been incorporated in Illinois to manufacture nut-locks, by James S. Dodson, Benjamin White and W. C. Eyster. The capital stock is placed at \$500,000.

Forsythe & Co., 643 West 4th street, New York City, manufacturers of perforated veneer seating, have purchased the business of Messrs. Herrick & Bergen, and have also secured the services of Mr. Herrick and Mr. Bergen. The firm has recently increased its capital and has also made considerable additions to its facilities for making perforated seating.

The Straight Fibre Iron Co., of Chicago, is employing 100 men at its new works at Fortieth street and Stewart avenue, which have a capacity of 100 tons of bar iron a day. The works of the company were destroyed by fire about a year ago, but the buildings have been rebuilt and greatly enlarged, and iron buildings have been erected in place of wooden ones. The company manufactures a high-grade of merchant iron and the "straight fibre" car axle. It was recently reorganized, the present officers being: J. McGregor Adams, President; Walter L. Lee, Vice-President and Manager; D. P. Donelson, Treasurer; F. Newell, Secretary; and M. C. Williams, Superintendent. The office is 769 The Rookery, Chicago.

William Sellers & Co., Incorporated, of Philadelphia, are to build a set of vertical bending-rolls to bend steel plates, 120 inches wide by 1½ inches thick, to either a cylinder or conical form and avoid calendering in the operation.

Proposals will be received at Watervliet Arsenal, West Troy, N. Y., until Dec. 26 for the manufacture of gun lathes and other machine tools, to be placed in the Army Gun Factory at Watervliet.

The Ranken & Fritsch Foundry & Machine Co. is building a very large Corliss engine, 34 x 60, for a new plant of the Waugh Steel Works, at Belleville, Ill. They are also just turning out a Corliss engine, 22 x 48, for a St. Louis Company.

The Fox Solid Pressed Steel Co. has filed a certificate in Illinois of the increase of the capital stock from \$750,000 to \$1,000,000.

The Dunham Manufacturing Co. reports large sales of the globe ventilator made recently to the Pullman Palace Car Co. and to the Missouri Pacific and Chicago, Burlington & Quincy.

The Schoen Manufacturing Co., of Philadelphia, which manufactures pressed steel articles for railroad equipment, has decided to move its plant to Pittsburgh where it is erecting fire-proof iron buildings. Contracts have been made for a complete plant on the hydraulic system which will have a capacity to turn out from about 50 tons per day of the articles made by the company. The works will be located adjacent to those of the Oliver Iron & Steel Co. The capital stock of the company has been increased to \$300,000. Mr. C. T. Schoen, of Philadelphia, is the President, and Mr. Henry W. Oliver, of Pittsburgh, is the Vice-President of the company.

Riehle Brs., of Philadelphia, have recently received the following orders, among others, for machines made by them: Self-adjusting railroad scales with rocking bearing, to the Carbon Iron Co., Pittsburgh, Pa.; Cooke Locomotive & Machine Co., Paterson, N. J., and also to the Savannah, Florida & Western, at Savannah, Ga.; one 100,000-lb. screw power testing machine to the Harlan & Hollingsworth Co., Wilmington, Del.; one 3,000-lb. rolling mill scale, Cataquaqua Manufacturing Co., Cataquaqua, Pa.; one 20,000-lb. heavy pig metal beam and cradle, North Alabama Furnace Co., Florence, Ala.; Riehle furnace-charging scale, Mont Alto Iron Co., Mont Alto, Pa., and one 10-ton Robie screw-jack to the Mont Alto Railroad, Mont Alto, Pa.

The Archer Gas Fuel System and is now largely used by many of the large iron, steel and other manufacturing companies. Among the number using the system are: The Bethlehem Iron & Steel Co.; Pennsylvania Steel Co., Steelton; Allison Mfg. Co., Philadelphia; Illinois Steel Works, Newark, N. J.; Cleveland Rolling Mills; Burden Iron Co., Troy; Detroit Steel & Springs Works; Bay City Iron Ship Yard; Johnston Co. Steel Works, Johnstown, Pa. J. B. Archer, 45 Broadway, New York, is agent.

Iron and Steel.

The rolling-mill of the Stewart Iron Co., Limited, at Sharon, Pa., which has been idle for more than a year, has been again put in operation. The two blast furnaces of the company are also in operation.

Andrew Lennox, of Allegheny City, Pa., is building one heating furnace and one open-hearth steel-melting furnace, of the Smith type, for Jennings Brothers & Co., Allegheny City.

The East Pennsylvania Furnaces, at Lyons, Pa., owned by the Philadelphia & Reading, are to be demolished and the material used to repair other furnaces.

The Allegheny Bessemer Steel Co. is to greatly enlarge its plant at Duquesne, Pa., and nearly double its capacity. The two converters used are to be replaced by larger ones, and the cupolas enlarged. The steam capacity will be added to by the erection of four new boilers.

The Kingsland Steel Co. has been organized at Pittsburgh by residents of that city. A large part of the capital stock has been subscribed. The site for the works has not yet been chosen.

The Pittsburgh Steel Casting Co. is to begin work at once on a Bessemer steel plant in connection with its foundry, so that Bessemer steel castings up to 16,000 lbs. in weight can be made. An 8-ton converter will be erected, and the new plant will probably be in operation in April. One of the principal products of the new department will be heavy steel rolls.

The blast furnace of Andrews Brothers & Co., at Haslet, O., which has been undergoing repairs for some time, has been blown in. It is now 75 x 10 ft., with three 75 x 18 Cowper-Kennedy stoves.

Edward M. Parrott has been appointed Receiver of the Cameron Iron & Coal Co., of Emporium, Pa., the company having defaulted on its bonds, of which \$1,000,000 were issued in March, 1888. The Central Trust Co., of New York, is Trustee.

The Rail Market.

Steel Rails.—Eastern mills still quote \$35, and at Pittsburgh and Chicago quotations are respectively \$35 @ \$30 and \$36.50 @ \$37. Inquiries are not very numerous. A southwestern is asking prices on 24,000 tons. The last report of the Board of Control shows that the sales for 1890 delivery of the mills, excepting one not in the association, aggregated about 500,000 tons on Dec. 1. This probably does not include a number of transactions really if not formally closed. The sales now amount to probably 700,000 tons. Nearly all these purchases are to cover renewal requirements of old roads.

Old Rails.—Sales have been made in New York at \$27. At Pittsburgh old steel rails have been sold at \$23.50 @ \$21. No sales of old iron rails are reported, \$27.50 @ \$28 being quoted. The last sale reported was at \$28 at Chicago. Old iron rails sell at \$26.50, and old steel rails at \$21.50 @ \$22 and \$20.50, according to length.

Car Lighting.

The Burlington is trying the dry carburettor gasoline system on some of its passenger equipment.

Westinghouse vs. Boyden.

The Westinghouse Air Brake Co. has brought suit against the Boyden Power Brake Co. for an injunction against the use by the latter company of the quick-action triple valve. The Westinghouse Co. alleges infringement of its patents. The Boyden Co. denies the infringement and will defend the suit.

The Davies Steel Spike.

The New York Central & Hudson River Railroad has given an order to the Dunham Manufacturing Co. for 1,014,500 Davies spikes, to be delivered by April 1 next. The spike will be the standard 1½ in. width, as ordinarily used where especially wide bearing surface is not required.

Block Signaling and Interlocking on the Erie.

The Erie has given contracts for interlocking at Painted Post, where the Rochester Division connects with the main line, and at Erie Junction, the connection with the Jefferson Branch. A contract for block signaling the Susquehanna Division will probably be placed soon. It is not proposed to use any interlocking of the block signals on this division.

The New Omaha Bridge.

Mr. W. C. Pratt, 35 Wall street, New York, announces that a limited number of copies of Mr. George S. Morrison's report on the new Omaha bridge, by direction of the President of the Union Pacific Railway Co., have been placed in his hands for sale at \$5 each. We have before taken occasion to briefly review this valuable publication. The report is uniform in size and style with the reports on the Bismarck and Blair Crossing bridges, and comprises 28 pages of text (including appendices) and 20 photo-lithographic plates.

Arthur Kill Bridges.

We have received from a man who ought to know the following note, concerning the Senate bill for certain bridges across the Arthur Kill. "The bill introduced by Senator Hiscock for bridges across the Arthur Kill is simply a revival of a scheme promoted for a great many years for a similar object by C. K. Hamilton. There is no railroad connection that I know of behind it. One of the proposed bridges, that at New Brighton, is so perfectly absurd in its location that I do not think anything will come of it. It is simply another case of 'Monsieur Tonson come again.'"

New Stations and Shops.

The new Northern Pacific & Manitoba station at Winnipeg is nearing completion. The mason work has been finished for some time, and men are engaged at present on the interior.

The station now under construction for the Lake Erie, Essex & Detroit River at Walkerville, Ont., is one of the handsomest in Western Ontario.

All the machinery in the shops of the Louisville & Nashville at East Nashville, has been shipped to Howells, Ind., near Evansville, where the new shops are to be located, the shop at East Nashville and Mt. Vernon, Ill., being abandoned.

The plans are completed for the six new iron stations which are to span the sunken tracks of the New York Central & Hudson River, between Mott Haven and Williamsbridge, New York city. The exteriors will be entirely of iron, and they will cost about \$25,000 each. The stations will be located as follows: Melrose, at 102d street; Morrisania, at 168th street; Central Morrisania, at Vendover avenue; Tremont, at Tremont avenue; Fordham, at Pelham avenue, and Williamsbridge, at Olin avenue.

Permanent Way on French Railroads.

A correspondent of *Iron* predicts the abandonment of double-headed rails on the more prominent French railroads in the near future, and the substitution of the T-rail; the Southern and the Paris & Orleans roads being notable exceptions, double-headed rails being still regarded with favor on these lines. There is a noticeable increase in the weight of the rails, which average 88½, 89 and 94½ lbs. per yard. Besides the increase in weight, a movement in the direction of a greater length than eight metres, or 26½ ft., which commenced 10 years ago, seems setting in, the tendency being toward the adoption of 12 metres, or about 39½ ft., as the standard length. The ordinary wooden cross tie is in general use; the home supply being supplemented by importations from Austria. In 1885, the six largest French roads imported 900,000 ties, while 3,250,000 were obtained from native sources of supply. The dependence upon the foreign supply is gradually growing less, owing to the increasing home facilities, and the comparatively long life of the ties, due to preservative treatment. Besides this, the use of metal cross ties is growing steadily. The first noteworthy trials with these were instituted on the French government roads, on which the designs of Paulet, Post, Boyenval and Ponsard, Cantero and Severac were successively tested. The metal ties now in use on the Eastern and the Western lines deserve brief mention. On the former, what is known as the Guillaume tie is used, in which an effort has been made to approximate closely to the wooden cross tie, especially in the matter of securing a flat lower surface. The cross section of the tie is an inverted channel, and the ends are slightly turned down. The rail rests on wooden blocks placed in the hollow part of the tie, and is properly secured against tipping and lateral displacement. Each tie weighs about 143 lbs., the 30-foot rails weighing about 89 lbs. per yard. The requirements

specified for ties on the Western Railroad were that it should offer great resistance to lateral thrust and admit of proper fastening of the rails in chairs. An inverted trough-shaped tie was adopted. Holes are bored through the vertical side of the ties, and the chairs are cast on, the holes filling with metal, and thus helping to properly secure the chairs. The tie alone weighs 132 lbs.; with the cast-iron chairs the weight amounts to 242 lbs. In view of the good results secured with this tie, on an experimental section, it is to be extensively introduced.

In the matter of fastening devices for the rails, steel is generally used. Chairs are employed to a considerable extent, being secured to the ties by means of screw bolts. These latter are also gradually displacing spikes where the rails are secured directly to the ties. In place of wooden wedges to secure the rails in the chairs, a bent steel strip is gaining favor, holding the rails through spring action. Angle plates are used at the rail joints in nearly all cases, the plain fishplates being, however, retained on the government roads. The arrangements adopted to prevent creeping of the rails vary according to the type of rail. In the case of double headers, one of the fishplates, on either side of the rails, is so placed as to be braced against a rail chair. With flanged rails, the horizontal leg of one of the angle plates is generally fastened to the cross tie by means of screw bolts. On the Northern Railroad, where an 89½-lb. rail is used, the angle plates measure 26 in., and are secured by 1-in. bolts. The screw bolts are galvanized. A layer of tarred felt is placed between the rail flange and tie to prevent entrance of sand and moisture.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulations of Railroads.

In Iowa the Federal Circuit Court holds that on a bill to restrain the Board of Railroad Commissioners from carrying into effect a schedule of rates established by them, on the ground that they are so low as to be ruinous to the business of the road, if the evidence as to the probability of loss is so conflicting that the effect of the rates is doubtful, and largely dependent on future developments, and only about 4 per cent. of the local traffic will be affected by the reduced rate, relief will not be granted until experience has demonstrated that the rates are not compensatory.

It is not a violation of a temporary injunction against putting in force a schedule of rates, on the ground that they were unreasonably low, for the commissioners to make another schedule after investigating a complaint filed against rates charged by a railroad company, although the purpose of those making the complaint was to evade the injunction, and their conduct in attempting to procure a favorable decision on the complaint was improper, as the duty of the commissioners under the statute was to hear the complaint and establish proper rates.¹

In Tennessee the Supreme Court rules that where a statute gives power to a county to issue railroad bonds, and an election was held under the act, and a majority voted to issue the bonds, and the county court thereafter subscribed to the railroad stock, and agreed to issue the bonds thereon on performance of certain conditions by the railroad company, and the latter accepted the subscription and the agreement to issue the bonds on the specified conditions, there was a valid, binding contract, which was not affected by a subsequent change in the constitution, which took effect before the bonds were issued, and which annulled the act. Even if the act authorized only a donation of bonds, and not a subscription, the rights of the company became fixed on assenting to the conditions on which the county agreed to issue the bonds, and could not be altered by the subsequent constitutional change, though it consented to a future delivery of the bonds.²

In Iowa the Federal Court holds that under the state code declaring that a judgment against a railroad corporation for damages for personal injuries shall be a lien on the corporate property superior to the lien of mortgages, etc., the cost necessarily resulting from the action to procure the judgment and enforce the lien are entitled to like priority.³

In Arizona the Supreme Court rules that exemption from taxation of a railroad's right of way does not exempt improvements thereon. For purposes of taxation the situs of rolling stock is wherever such stock is habitually used in the business.⁴

Carriage of Goods and Injuries to Property.

In Louisiana, a railroad had erected a platform on which shippers were accustomed to place cotton to be taken by the next freight train that passed. The plaintiff's cotton was not taken by the first train, but after it had passed it was burned by a spark from a passing locomotive. The Supreme Court holds the railroad liable.⁵

A Texas statute renders a carrier who shall fail to feed and water live stock sufficiently during transportation, and until delivery, liable for damages, and for a penalty to be recovered by the owner. In a case there the cattle were well fed at one of the two feeding stations, and the evidence did not show that they were not so fed at the other. The Supreme Court holds this insufficient to authorize the assessment of the penalty. The evidence should clearly establish the statutory grounds for the recovery of a penalty.⁶

In the same state it is held by the same court that in an action to recover damages against a connecting carrier the facts that a through bill of lading was given by the first company; that through freight charges were made; that the freight was to be carried in a designated car for the whole distance; and that the agent of one of the defendants at the end of the route received the freight money—are sufficient to establish a joint liability.⁷

The Supreme Court of Illinois rules that one railroad is not justified in refusing to permit the owners of a coal mine to ship coal over its road because such owners also ship coal from the same mine over the road of another company.⁸

In Kansas the Supreme Court rules that in an action for damages caused by fire from locomotives, it is only necessary for the plaintiff to establish the fact that the fire complained of was caused by the operation of the road, and the amount of damages; and when it appears that, within a very few minutes after a train passed, the fire originated that caused the damages, in two or three places close to the track, the railroad company has the burden of showing that it was not the result of defective appliances or of negligence of the employes of the company.⁹

Injuries to Passengers, Employes and Strangers.

In Vermont the Supreme Court rules that a ticket entitling one to ride on a freight train in charge of stock is not good on a passenger train, and the holder, on refusing to pay fare, may be ejected. And the fact that he has been allowed to ride that way before is immaterial.¹⁰

In Missouri a caboose in which plaintiff was sleeping

when injured had become detached from its engine and train, and was resting at the foot of a long down grade, when the forward part of a freight train which had separated, and become unmanageable, ran into it from the rear, causing the injury. The trainmen on the caboose knew that there was a freight train in the rear; that it would reach them on a long down grade; that freight trains were liable to become detached, when they would not be under control; and that there was frost on the rails. The rear train could have been heard for two miles, but the trainmen flagged it only a fourth of a mile from the caboose, without warning plaintiff. The Supreme Court holds that they were guilty of gross negligence.¹¹

In Indiana the Supreme Court rules that where two railroads jointly maintain a platform over which passengers would naturally pass in going from the station of one company to that of the other, to take passage on the train of the latter, both companies are liable for injuries to a passenger so doing, resulting from the negligent condition of the platform.¹²

In New York it appeared that plaintiff's injuries were caused by his slipping on the platform on alighting from a train; that when the accident occurred snow and sleet were falling, and the platform where he was compelled to alight was slippery from ice or snow; that on the preceding day considerable snow had fallen, and that, though an attempt had been made to remove the snow from the platform, no sand or ashes had been sprinkled over it. The Supreme Court decides that this establishes a *prima facie* case of negligence against the company, and justifies a verdict for plaintiff.¹³

In Maryland, in an action by a husband for starting a train which, with his wife, was attempting to board, whereby she was injured, it appeared that the place at which the accident occurred, though not the regular platform built for the accommodation of passengers entering and leaving defendant's trains, was a place at which the trains were frequently boarded without objection, and that a person in the uniform of the defendant's officers directed plaintiff's wife to get on at that point. The Court of Appeals holds the railroad responsible.¹⁴

The Supreme Court of Minnesota holds that, independent of any rules of the company on the subject, a train hand is entitled to notice by signal or otherwise of the movement of the engine.¹⁵

In Kansas, a brakeman stepping from a moving train to set a switch slipped on some cinders and fell under the car. The ground around the switch had always been hard and level, but on that day the company had caused a large quantity of cinders to be unloaded on and around it for ballast, which had raised the ground and made it soft and spongy. The brakeman had no notice of the change. The Supreme Court holds the railroad liable.¹⁶

In Texas, the Federal Court rules that a telegraph operator is not a "fellow servant" with a brakeman, and that under rules requiring a telegraph operator "to report defects in roads and bridges, or obstructions of any kind, wherever met, to the superintendent, and, if possible, to the nearest section master or bridge foreman," it is the operator's duty to report such defects, etc., when they come to his knowledge, whether he is requested to do so by another employee or not.¹⁷

In Nebraska a contractor undertook to lay the track for a railroad, the latter to furnish the construction train and the men necessary to operate it, they to be employed and paid by the company, and to whom alone they were responsible while running the train. The Supreme Court holds that for injuries sustained by an employe of the contractor lawfully on the train, through the carelessness of those in charge of the train while passing over the track, the railroad is liable.¹⁸

In Kansas a workman, while at work on a trestle on defendant's road, on a foggy morning, was run over by a train running at a rapid rate of speed, and which gave no signal of its approach. The contractor under whom he was at work testified that defendant's officers in charge of the road were hurrying him up to complete the trestle; that he was going to put men at work on the trestle, and that such officers knew of the work being done, for they were passing over the road several times a day. There was evidence that for about an hour and a half before the accident, on the morning that it occurred, trains were running over the trestle every 15 minutes. The Supreme Court holds the railroad liable.¹⁹

In Arkansas the Supreme Court rules that a yard inspector, whose duties are to examine all cars as soon as they arrive, repair all slight defects he finds in them, and, in case of more serious defects, mark them "B. O." and have them sent to the repair shops; and a yard foreman, whose duties are to make up trains in the yard, couple cars and move cars marked "B. O." to the repair tracks—neither of whom are subject to the orders of the other, both being under the direction of a yardmaster—were fellow-servants, and neither can recover for the other's negligence.²⁰

In New York the plaintiff was injured while attempting to uncouple a moving train. There were present and unemployed at the time of the accident a switchman and a coupler, subject to the orders of plaintiff, who was yardmaster, and who had control of the movement of the train. The Supreme Court holds that plaintiff was negligent in attempting to uncouple the cars while moving; and especially in not placing one of the other employes where he could have immediately communicated plaintiff's signals to the engineer while in the dangerous position.²¹

In Kansas a railroad, by a rule, prohibited conductors and engineers from making flying switches. The Supreme Court rules that a brakeman working under the direction of an engineer, and killed while making a switch in the usual and customary way, was not guilty of contributory negligence, though he acted in disregard of such rule.²²

In Missouri, a railroad track used for the convenience of a coal company, passed through a shed in the engine-house and elevator building of the coal company, in which shed it was customary to leave cars of coal to be unloaded into the engine house through a triangular opening in the wall between the switch and the engine house, the lower angle of which was about level with the floor of the car, and the opening constituted a convenient passway for a man from the car to the engine house. At the time of the accident defendant railroad company had left a car of slack coal on the switch to be unloaded, and sent an engine from the east to take up a car of nut coal, which extended under the shed until its west end was opposite the opening and against the east end of the car of slack, and the engine with a brakeman and engineer proceeded slowly but noiselessly, without signals, and forced the car of nut coal backward, and the projection of a standard socket caught and crushed the foot of an employe of the coal company, who, without knowledge of its approach, was unloading the car of slack, and who had set his foot on the lower angle of the opening, and was passing into the engine house. The evidence showed that before that time engines had

always approached the shed from the west. The Court of Appeals holds the railroad liable.²³

In Texas the plaintiff was injured in attempting to avoid an apprehended danger from defendant's alleged negligence. Others, who had been in the same position, under similar circumstances, and took no action, were not injured, and there were two courses open to plaintiff by which he might have escaped peril. The Supreme Court rules that a charge that if defendant failed to take proper care, and plaintiff, while using proper care, became frightened and excited, and for his safety attempted to take the course he did, and in the attempt was injured, the jury would find for plaintiff, was erroneous, as making defendant's liability depend, not on its negligence, but on the plaintiff's fright, without reference to the inquiry whether the fright was justified, or whether defendant, in producing the cause of the fright, was guilty of the want of proper care, or whether, in attempting to escape, plaintiff used such means as an ordinarily prudent man would use under like circumstances.²⁴

In New York, where a collision occurred by a car being blown by the wind from a side track to the main line, it is held by the Supreme Court that it is for the jury to decide whether the car has been so secured on the side track that no wind which could be reasonably anticipated could move it.²⁵

In Minnesota a man was employed in a lumber yard, and was loading a car with lumber. He was standing on a plank, one end of which was resting on the car, and the other on a saw-horse standing between the rails of the track. A loaded car was standing a few feet in front of the car which he was loading, and one of the defendant's employees attempted to couple the loaded car onto a train to remove it, but missed the coupling and the car was driven against the car which he was loading, throwing him upon the rail, inflicting injuries from which he died. The Supreme Court holds the railroad liable.²⁶

²³ C., B., & Q. R. Co. v. Dey, 39 Fed. Rep., 656.
²⁴ Nelson v. Haywood Co., 11 S. W. Rep., 885.
²⁵ Central Trust Co. v. Cent. Ia. R. Co., 39 Fed. Rep., 889.
²⁶ A. & P. R. Co. v. Yavapai Co., 21 Pac. Rep., 768.
²⁷ Meyer v. Y., S. & P. R. Co., 6 South. Rep., 218.
²⁸ Good v. G. H. & S. A. R. Co., 11 S. W. Rep., 854.
²⁹ Int. & G. N. R. Co. v. Tisdale, 11 S. W. Rep., 900.
³⁰ C. & A. R. Co. v. Sutfern, 21 N. E. Rep., 824.
³¹ A. T. & S. F. R. Co. v. Gibson, 21 Pac. Rep., 788.
³² Thorp v. Concord R. R., 17 Atl. Rep., 791.
³³ Whitehead v. St. L. I. M. & S. R. Co., 11 S. W. Rep., 751.
³⁴ Louisville N. A. & C. R. Co. v. Lucas, 21 N. E. Rep., 968.
³⁵ Timpson v. Manhattan R. Co., 5 N. Y. (Supr.), 684.
³⁶ B. & O. R. Co. v. Kane, 11 Atl. Rep., 1,032.
³⁷ Soboleski v. St. P. & D. R. Co., 42 N. W. Rep., 863.
³⁸ K. C. Ft. S. & G. R. Co. v. Kier, 21 Pac. Rep., 770.
³⁹ Hall v. G. H. & S. A. R. Co., 39 Fed. Rep., 18.
⁴⁰ C. B. & Q. R. C. v. Clark, 42 N. W. Rep., 703.
⁴¹ Int. C. R. T. R. Co. v. Fox, 21 Pac. Rep., 797.
⁴² St. L. Iron M. & S. R. Co. v. Rice, 11 S. W. Rep., 699.
⁴³ Bapis v. S. B. & N. Y. R. Co., 5 N. Y. Supp., 804.
⁴⁴ U. P. R. Co. v. Springsteen, 21 Pac. Rep., 774.
⁴⁵ Ridings v. H. & St. Joe. R. Co., 33 Mo. App., 527.
⁴⁶ A. & N. W. R. Co. v. Beatty, 11 S. W. Rep., 858.
⁴⁷ Webster v. R. W. & O. R. Co., 21 N. E. Rep., 725.
⁴⁸ Jacobson v. St. P. & D. R. Co., 42 N. W. Rep., 932.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Albany & Susquehanna, 3½ per cent., payable Jan. 2.
Boston, Revere Beach & Lynn, 3½ per cent., payable Jan. 1.

Liehigh Valley, quarterly, 1½ per cent., payable Jan. 15.
Little Miami, 4 per cent., payable Dec. 24.

Manhattan Elevated, 1½ per cent., payable in certificates, Jan. 2.

New York, New Haven & Hartford, quarterly, 2½ per cent., payable Jan. 3.

Northern Central, semi-annual, 5 per cent., payable Jan. 15.

Richmond, Fredericksburg & Potomac, 3 per cent., payable Jan. 2.

Southwestern (Georgia), \$3.50 per share, payable Dec. 8.
Tyron & Clearfield, 2½ per cent., payable, Jan. 30.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Clearfield & Jefferson, special, Dec. 27.
Cleveland & Pittsburgh, annual, Cleveland, O., Jan. 1.

Colorado Midland, special, Colorado Springs, Colo., Dec. 31, to act upon a proposed lease of the Rio Grande Junction.

Columbus, Hocking Valley & Toledo, annual, Columbus, O., Jan. 14.

Denver & Rio Grande, special, Denver, Colo., Dec. 31, to act upon a proposed lease of the Rio Grande Junction.

Louisiana North & South, annual, Gibsland, La., Jan. 15.

New York, Ontario & Western, annual, 16 Exchange Place, New York City, Jan. 15.

Rome, Watertown & Ogdensburg, annual, 96 Broadway, New York City, Dec. 28.

Utah Midland, annual, Walker House, Salt Lake City, Utah, Jan. 6.

Western New York & Pennsylvania, annual, 242 South Third street, Philadelphia, Pa., Jan. 13.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Society of Civil Engineers will hold its next annual meeting at the rooms of the Society, 127 East Twenty-third street, New York City, Jan. 15, at 10 o'clock.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:30 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of each month.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Wichita* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Association of American Railway Accounting Officers.

A regular meeting of the association will be held at the St. Charles Hotel, New Orleans, La., on Jan. 22, at 10 a. m.

The following business will be brought before the convention:

1. Consideration of report of committee on terms to express the financial condition of a railroad.

2. Consideration of report of special passenger committee.

3. Consideration of proposed amendments to the constitution.

These subjects are explained at length in the third report of the association.

4. Report of executive committee.

5. Report of standing committee on freight matters.

6. Report of standing committee on passenger matters.

7. Address by Mr. W. Randall on joint freight and passenger accounts.

8. Address by Mr. Stephen Little on railway disbursements.

9. Address by Mr. G. M. Taylor on corrections with connections in freight settlements.

The executive committee will suggest an amendment of the by-laws, changing the order of business, and expunging sections XII, and XIII.

Arrangements have been made with the St. Charles Hotel, by which a rate of \$3 per day per head will be granted to members of the association and their families attending the convention. Members must give the proprietor at least 21 days' notice of the accommodation they desire.

Association of Engineering Societies.

A meeting of the Board of Managers of the Association of Engineering Societies was held in Chicago, Dec. 3 and 4, 1889.

The meeting was called to order by the Chairman, Benezette Williams, of the Western Society, and Prof. J. B. Johnson, of the Engineers' Club of St. Louis, was elected secretary *pro tem.*

There were present: Benezette Williams and L. P. Morehouse, of the Western Society; S. E. Tinkham, of the Boston Society; W. H. Searles, of the Cleveland Club; Wm. B. Knight, of the Kansas City Club, and Wm. H. Bryan and J. B. Johnson, of the St. Louis Club.

The Chairman stated the object of the meeting to be the election of officers of the board, making a new, or renewing the old, arrangement for the publication of the *Journal*, and to consider the question of a closer affiliation of the engineering societies of the country.

After a general discussion of the powers of the Board and the desirability of a national organization of engineering societies, it was moved that a committee of three be appointed by the Chairman to formulate amendments to the present Articles of Association, and report at an adjourned meeting. The motion prevailed, and Messrs. Tinkham, Searles and Bryan were appointed as such committee.

The Chairman appointed a Committee of the Board to prepare an address to the various engineering societies of the country on the subject of a national organization, and to submit a progress report to an adjourned meeting of the Board for approval. Messrs. Johnson, Knight and Searles were appointed on such committee.

The Board then adjourned to meet on the following day.

Dec. 4 the Board was called to order by the Chairman, Present, Messrs. Williams, Morehouse and Gottlieb, of the Western Society; Tinkham, of Boston; Searles, of Cleveland; Knight, of Kansas City, and Johnson, of St. Louis.

Mr. Searles reported the following amendments to the Articles of Association:

Amendment I.—Upon application to the Board of Managers by any society member of this association, the Board shall have power to lay before the several societies any question of scientific, technical or professional interest, with the request that each society investigate the subject named, and report upon the same to the Board by a certain date. Upon the receipt of the several reports the Board shall formulate a general report embodying the facts and in accordance with the general sense and tenor of the local reports, and this report shall be published in the *Journal* as the sense of the association.

Amendment II.—The Board of Management may make recommendations on any subject affecting the policy of the Association or the mutual relations of the participating societies, and submit the same in the form of resolutions to be acted upon by the several societies. If these resolutions be adopted by two-thirds of the societies, they shall become the law of the Association, and binding upon all participating societies.

The report was accepted and the committee discharged.

The amendments were adopted by the Board and the Chairman instructed to submit them to the several societies in the Association for their ratification.

Mr. John W. Weston submitted a proposition for pub-

lishing the *Journal*, and after a general discussion the proposition was accepted, to take effect with the April number of the *Journal*.

Mr. Johnson made a progress report for his committee, outlining a scheme for the formation of a federation of all engineering societies in America, and the skeleton of an address to such societies on this subject. The committee was continued and instructed to perfect the address and submit it to all the members of the Board for their approval.

The Board then proceeded to the election of officers. Mr. Benezette Williams was unanimously elected Chairman and Mr. John W. Weston Secretary, his duties to begin with the transfer of the duties of publisher to him by the *Railroad Gazette*.

The following resolution was unanimously adopted:

Resolved, That the thanks of this Board be extended to Mr. H. G. Prout for his long and efficient services as Secretary, and that we regret the termination of his official relations with the Board.

Boston Society of Civil Engineers.

A regular meeting was held Nov. 20. Mr. Lewis M. Hastings was elected a member. The Secretary was instructed to extend the thanks of the Society to the Massachusetts Dredging Co. for courtesies shown on the occasion of a recent visit to the company's hydraulic dredge. The Government was instructed to appoint a committee to report to the Society on the advisability of urging upon the Legislature the necessity of having the sheets of the new state map printed and placed within reach of the people of the state.

A paper by Mr. E. L. Abbott, of the Poetsch-Sooysmith Freezing Co., was read, entitled The Freezing Process of Making Excavations in Wet Ground. Mr. D. E. Moran read the paper, owing to the absence of the author, and supplemented it with an account of sinking a shaft through quicksands at Iron Mountain, Mich., by this process. A vote of thanks to Mr. Abbott and Mr. Moran was passed.

Engineers' Club of Philadelphia.

A business meeting was held Dec. 7, 1889, President William Sellers in the chair; 29 members and two visitors present.

The Secretary presented the following report from the Committee on Highway Bridges:

Your Committee on Highway Bridges, appointed at the business meeting held June 16th, 1888, to co-operate with the Engineers' Club of Kansas City and the Western Society of Engineers, in efforts to properly regulate, by law and otherwise, the design and inspection of highway bridges, made a report of progress Oct. 6, 1888, in which they gave a general outline of views upon the methods suggested by these societies, and expressed a willingness to co-operate.

A copy of the report was forwarded to these societies. Since that time there have been no further communications received, asking co-operation, or outlining any plan for it.

Your Committee would therefore respectfully ask to be discharged.

HENRY B. SEAMAN,

WM. H. BURR,

HENRY G. MORSE.

This report was received and the Committee discharged. Nominations were made for officers to serve during the fiscal year 1890.

Mr. Geo. Burnham, Jr., described the Spirally Welded Steel Tubing made at East Orange, N. J., exhibiting a length 10 in. in diameter by 9 ft. 5 in. long. The pipe is made as follows: A ribbon of steel of the desired width and length is fed to a guide table at the proper angle with the axis of the pipe machine. This machine, operated by a belt from a countershaft, automatically winds the steel into a spiral tube. The incoming edge of the steel passes through a small furnace about a foot square, inclosing a blow-pipe flame of water-gas and air which heats both edges of the pipe to a welding heat. A small hammer, with a rapid action, weids the overlapping edges as the pipe feeds forward. The pipe is stiff and light, and is said to be very strong, the usual gauges of stock used being from 16 to 14 B. W. G., for pipes from 6 in. to 24 in. diameter. It is used for conveying gas, water, steam, etc., at the usual pressures required.

There was considerable discussion of this contribution and of other matters of interest connected with pipes and joints.

Mr. A. P. Broomell presented an illustrated paper upon a New System of Street Car Propulsion.

After some discussion of Mr. Broomell's paper the meeting adjourned.

Engineers' Club of St. Louis.

The annual meeting was held Dec. 4. Mr. R. S. Conlon was elected a member. Mr. Robert Moore submitted a report from the standing Committee on Collection of Local Engineering Data. The report contained a considerable list of notes contributed by various members, covering a variety of subjects, mostly in municipal engineering. The committee was continued and requested to present a final report as soon as convenient. A committee was appointed to arrange a banquet for Prof. T. C. Mendenhall, Superintendent of the Coast Survey, on his approaching visit to St. Louis. Annual reports from the Executive Committee and the various officers were then presented.

Mr. N. W. Perkins, Jr., addressed the club on the subject of Adding Machines, treating particularly on the invention of Mr. W. S. Burroughs. The matter was considerably discussed.

National Association of General Baggage Agents.

The ninth annual convention of this association will be held at the Ebbitt House, Washington, D. C., Jan. 15. The matter of the transportation of dead bodies will be considered, and authoritative decisions from general passenger agents are desired. Members are requested to bring the decision of their respective auditors regarding the use of C. O. D. checks. Each member is requested to send to the Secretary, J. E. Quick, Detroit, Mich., immediately after Jan. 1, a list of foreign unclaimed baggage on hand.

PERSONAL.

—Mr. Anthony Jones, who has been Chief Engineer of the Long Island road for the last seven years, has resigned that position.

—Mr. Morris M. Defrees, Chief Engineer of the Ohio, Indiana & Western, has resigned after a service of seven years with that company.

—Mr. G. H. Hepburn, Assistant General Freight and Passenger Agent of the Tavares Orlando & Atlantic, has resigned. His successor is Mr. R. B. Foss.

—At the annual meeting of the Tennessee Midland, held at Memphis, Dec. 12, Mr. R. L. Traylor, Secretary, was elected Vice-President, to succeed Mr. T. C. Leake, Jr., deceased.

—Mr. J. J. Collier, auditor of the Louisville, Evansville & St. Louis road, has resigned to accept the Secretoryship of the City Coal Gas Co., in New York City.

—Mr. W. R. Peabody, General Agent of the Atchison, Topeka & Santa Fe at Cincinnati, has resigned. He was formerly General Agent of the same road at Atchison and St. Joseph.

—Mr. L. N. Martin, who has been Superintendent of the St. Louis, Des Moines & Northern, has been appointed General Manager of the reorganized company, the Des Moines & Northern.

—Mr. J. J. Burns, President, and Mr. W. R. Gray, General Manager of the St. Joseph Valley road, have retired from the management of the company. Mr. F. McOmber has been elected General Manager.

—Mr. C. J. Smith, of the St. Paul, Minneapolis & Manitoba, has been appointed General Freight and Passenger Agent of the Canada & Atlantic, to succeed Mr. Percy Doid, who has been appointed General Freight Agent of the West Shore.

—Mr. John H. Inman has been elected President of the Richmond & Danville to succeed Mr. George S. Scott, who resigned, as he contemplates a trip to Europe, and will be absent from this country a long time. Mr. Inman is also President of the Richmond & West Point Terminal Co.

—Mr. A. C. Haskell declined a re-election as President of the Charlotte, Columbia & Augusta, at the recent annual meeting in Columbia, S. C., and Mr. V. E. McBee, Superintendent of the Western North Carolina Division of the Richmond & Danville, was chosen to succeed him.

—Mr. J. A. Shinn, formerly Auditor, but more recently General Freight Agent, of the New York & New England, has resigned, and has been succeeded by Mr. J. M. Williams, who has been General Freight Agent of the New York, Providence & Boston Railroad, and of the Providence & Stonington Steamship Co.

—Mr. John H. Green has been appointed Passenger Agent of the Chicago, St. Paul & Kansas City, with headquarters at Des Moines, Ia. Mr. Green will have immediate supervision of the passenger business of that company in the State of Iowa. The appointment went into effect Dec. 2, 1889.

—Mr. Clemens Herschel, hydraulic engineer of the Holyoke Water Power Co., has resigned to take charge of the construction of the large water works at Newark, N. J. Mr. Herschel has been Consulting Engineer for many important companies, and has also served on the Massachusetts State Railroad Commission.

—Mr. John J. Fitzpatrick, a prominent railroad contractor, died in Lancaster, Pa., Dec. 14, after a lingering illness, aged 47 years. Mr. Fitzpatrick aided in the construction of the North Pennsylvania, the Bound Brook, the Pittsburgh & Lake Erie and South Penn roads, and the Chestnut street bridge, Philadelphia, and was well known.

—Mr. G. M. Cumming, General Manager of the Mountain division of the Union Pacific, has resigned, and has been succeeded by Mr. C. F. Ressique, Superintendent of the Nebraska division of the road. Mr. Cumming was formerly General Manager of the St. Joseph & Grand Island.

—Mr. A. J. Broughel has resigned as Master Mechanic of the Central New England & Western, to accept a similar position on the St. Joseph & Grand Island. Mr. John Hawthorne, who succeeds him as Master Mechanic of the Central New England & Western, has been Master Mechanic of the New York, Lake Erie & Western at Hornellsville.

—Mr. W. B. Lamb, Engineer of Maintenance of Way of the North Carolina division of the Richmond & Danville Railroad, died in Richmond, Va., Dec. 8. Mr. Lamb had been for a number of years connected with various railroad companies as civil engineer, and had been in the service of the Richmond & Danville, the Central of Georgia and for three years with the Mobile & Ohio.

—Mr. E. P. Ripley, General Manager of the Burlington, and party, who have been traveling in Mexico in the private car "Lycoming," have returned. The trip is reported to have been very pleasant one, without accident, and the party enjoyed themselves exceedingly. Among the party were Mr. and Mrs. E. P. Ripley, Mr. and Mrs. C. M. Higginson, Mr. and Mrs. D. Richardson, and Mr. E. A. Diner.

—Mr. W. W. Starr, who has been Superintendent of the Southwestern division of the Central of Georgia since August, 1888, when he succeeded Mr. Theodore D. Kline, resigned, has been appointed General Superintendent of Transportation of the road, to succeed Mr. D. W. C. Rowland, resigned. Mr. Starr began his railroad service as a telegraph operator, and since 1874 has been connected with the Central of Georgia system. He was Superintendent of the Port Royal & Augusta division two years before his appointment as Superintendent of the Southwestern division.

ELECTIONS AND APPOINTMENTS.

—*Atchison, Topeka & Santa Fe.*—W. W. Allen has resigned his position as Manager of the coal properties, and C. J. Devlin has been appointed his successor.

—*Bellaire, Zanesville & Cincinnati.*—W. R. Crumpton has been appointed General Manager at Zanesville, O., to succeed J. H. Burgoon, who has also been Receiver.

—*Boston & Maine.*—The directors have re-elected George C. Lord President, James T. Furber Vice-President and Amos Blanchard Treasurer. C. P. Judd has resigned as clerk, and Richard Olney will act temporarily.

—*Central of Georgia.*—John H. McGill has been appointed Master Mechanic, with headquarters at Atlanta.

—*Clarion River.*—Chartered in Pennsylvania by W. H. Hyde, J. K. P. Hall and J. K. Gardner, of Ridgway; Andrew Kane, B. E. Wellendorf, B. F. Hall and Harry Alvan Hall, of St. Mary's.

—*Concord & Montreal.*—The first meeting of the stockholders of the road was held in Concord, N. H., Dec. 18. The ballot for directors resulted as follows: Frederick Suyth, W. M. Parker and Noah S. Clerk, of Manchester; B. A. Kimball, John S. Pearson, John A. White and S. S. Kimball, Concord; Alpha J. Pillsbury and Charles E. Tilton, of Tilton; Charles E. Morrison, Boston; Lewis C. Pattie, of Winchester, Mass.; Charles A. Busiel, of Laconia, and E. M. Turner, of St. Johnsbury, Vt. There were 18,452 shares voted.

—*Connecticut River.*—The annual meeting of the stockholders of the road was held in Springfield, Mass., Dec. 17, and the following directors were elected, the only new member being Elisha F. Lane: N. A. Leonard and Frederick H. Harris, of Springfield; Oscar Edwards, of Northampton; Charles F. Sargent, of Brookline; William R. Cone, of Hartford; A. B. Harris, of Boston; Frederick Billings, of Woodstock, Vt.; A. T. Perkins, of Barnstable; William Whiting, of Holyoke; E. T. Lane, of Keene, N. H.

—*Denver, Texas & Gulf.*—C. S. Mellen has been appointed General Traffic Manager of the Texas Panhandle route, with office at Omaha. He will have full charge of all matters relating to passenger and freight traffic.

—*Des Moines & Northern.*—L. M. Martin has been appointed General Manager, with headquarters at Des Moines, Ia.

—*Eureka Springs.*—George West has been appointed Auditor and General Freight Agent of the line, at Eureka Springs, Ark., in place of Arthur H. Foote, resigned.

—*Florida Central & Peninsular.*—T. A. Phillips has been appointed Assistant General Manager of the road, with headquarters at Jacksonville, Fla. W. H. Pleasants has been appointed Assistant General Freight Agent, vice James Mizner, resigned.

—*Georgia Midland & Gulf.*—C. B. Jones has been appointed General Freight and Passenger Agent of the road, with office at Columbus, Ga., to succeed C. W. Chears, who resigned to accept a position with the Central of Georgia.

—*Hartford & Connecticut Western.*—The company held its annual meeting in Hartford, Conn., Dec. 17. The old board of directors was re-elected.

—*Housatonic.*—The following Board of Directors was elected at the annual meeting Dec. 17: William H. Starbuck, J. L. Macauley, Henry Hantz and T. Rutler, of New York; W. H. Stevenson, of Bridgeport; S. E. Merwin, of New Haven; P. C. Lounsbury, of Ridgefield; A. B. Mygatt, of New Milford, and W. E. Downes, Birmingham. At a subsequent meeting of the Board the following officers were elected: President, W. H. Starbuck; Vice-President and General Manager, W. H. Stevenson; Secretary and Treasurer, M. E. Stone, C. E. Robinson, Assistant Treasurer; A. J. Porter, Secretary.

—*Intercoastal.*—The following are the officers of this company: A. B. Forwood, Chairman; C. W. Hoghton, Secretary; James Livesey & Son, Consulting Engineers, and A. L. Alexander, Resident Engineer in Mexico. The company's registered office is Dashwood House, 9 New Broad Street, London.

—*The officers of the Construction Co.* are: Director General, Delfin, Sanchez; Representative, F. Gillham, C. E., London and Mexico; Chief Engineer, E. B. Forbes, Mexico. General offices in Mexico, 14 Calle de San Agustin, and offices in London, Winchester House, Old Brad street.

—*Kansas City, Fort Scott & Memphis.*—John A. Sargent has been appointed Assistant General Freight Agent of this road at Memphis, Tenn., to succeed A. J. Vandlingham, resigned.

—*Kearney, Hutchinson & Gulf.*—The incorporators of this Nebraska company are: F. F. Robertson, H. J. Allen, H. C. Andrews, Ross Gamble, F. J. Switz, Sylvester St. John, J. W. Tisdel, H. G. Wiley, N. A. Baker, H. H. Martin, B. H. Bicknell, M. A. Brown, C. D. Swan, W. C. Holden, Roy H. Rhone, F. J. Carpenter, L. R. Britton, George D. Aspinwall, L. B. Cunningham, W. W. Patterson, A. H. Bolton, A. H. Connor, J. S. Harrington and J. S. Stacy.

—*Kentucky Union.*—Patrick Ryan has been appointed Master Mechanic, with headquarters at Winchester, Ky.

—*Knox & Lincoln.*—At the annual meeting of the stockholders of the road, held recently, the following Board of Directors was elected: John T. Berry, John Case, A. F. Crockett, Rockland; W. E. Vinal, Thomaston; Edwin O. Clark, Walldoboro; D. W. Chapman, Damariscotta; Ebenezer Huggett, Newcastle; Henry Ingalls, Wiscasset; John J. Richardson, John R. Kelley and James W. Wakefield, Bath, Me.

—*Lackawanna & Southwestern.*—The following are now the officers of this company: Edward Mahony, President, and George G. Chapman, Vice-President, 48 Wall street, New York; W. H. Badger, General Superintendent; M. S. Blair, Auditor and Assistant Treasurer; Chas. H. Hammond, General Freight and Passenger Agent, all at Angelica, N. Y.

—*Macon & Birmingham.*—W. H. Griswold has been appointed Resident Engineer at Woodbury, Ga.

—*Memphis, Little Rock & Indian Territory.*—G. A. Melair, B. E. Orr, F. F. Smith, J. F. Fagan and J. J. Sumpter have chartered this company in Arkansas.

—*Milwaukee & Northern.*—J. J. Coleman, Northwestern Freight Agent of the Louisville, New Albany & Chicago, in Milwaukee, has been appointed General Freight Agent of this road, vice J. C. Forrester, resigned.

—*Missouri Pacific.*—E. O. Man has been appointed Superintendent of the Western Division of this road at Atchison, Kan., to succeed J. A. Edson, resigned, to accept service with the St. Louis, Arkansas & Texas.

—*Monterey & Mexican Gulf.*—W. H. Davis, formerly with the freight department of the Nashville, Chattanooga & St. Louis, at Nashville, has been made Auditor of this road, with headquarters at Monterey, Mex.

—*Natchez, Red River & Texas.*—The stockholders of the road held their annual meeting in Vidalia, Ga., recently, and elected the following officers and directors: President, Hugh Porter, of New York; Vice-President and General Manager, Hiram R. Steel, of Natchez; Secretary and Treasurer, W. H. Murphy, of New York. Directors: George W. Debevoise and Charles H. Stone of New York, R. F. Learned and Louis Bott, of Natchez.

—*New York & New England.*—J. M. Williams has been elected General Freight Agent, with headquarters at Boston.

—*New York, New Haven & Hartford.*—The Board of Directors was re-elected at the annual meeting in New Haven, Conn., Dec. 18, as follows: Joseph Park, Chauncey M. Deepw, Wm. Rockefeller, George N. Miller, Wilson G. Hunt and E. H. Trowbridge, New Haven; William D. Bishop and Nathaniel Wheeler, Bridgeport; Henry C. Robinson, Hartford; Edward M. Reed and Charles P. Clark, New Haven; Henry S. Lee, Springfield, and Everett Brainard, Hartford.

—*Ohio River.*—A. J. Bandy has been appointed Assistant General Freight and Passenger Agent at Parkersburg, W. Va.

—*Pennsylvania.*—W. B. McCable has been appointed Assistant Engineer of the West Pennsylvania division, vice Thomas H. Dobson, resigned.

—*Puget Sound & Great Eastern.*—The officers of this Oregon company are: President, Wm. Van Fleet, 11 Wall street, New York; First Vice-President and General Manager, J. Luttrell Murphy, Seattle, Wash.; Secretary, Lemuel J. Heacock; Treasurer, W. J. Broadwell; Chief Engineer, Henry M. Crocken, Seattle, Washington.

—*Richmond & Danville.*—At the adjourned annual meeting of the stockholders of the company held Dec. 18, the following directors were elected: President, John H. Inman; George S. Scott, Calvin S. Brice, H. C. Fahnestock, John A. Rutherford, J. C. Maben, Samuel Thomas, John G. Moore, John C. Calhoun, Charles M. McGhee, John H. Hall, all of New York; John S. Barbour, of Virginia; Samuel M. Inman, of Atlanta, Ga.

—*St. Joseph & Grand Island.*—A. J. Broughel has been appointed Master Mechanic, with headquarters at St. Joseph, Mo.

—*St. Louis & Eastern.*—The incorporators and first board of directors of this Illinois company are: H. S. Dunke and J. S. Brewer, of Chicago; William F. Neidringhaus, George O. Carpenter, William E. Gray, J. L. Blair, William L. Huse, John T. Davis and Charles W. McClure, of St. Louis, Mo.; E. Springer, of Edwardsville, and C. E. Bradish, of Alton, Ill.

—*San Domingo Central.*—The directors of the company have elected the following officers: President, Horatio C. King; Vice Presidents, H. L. Bean and G. G. Ward; Secretary, J. E. Coleman; Treasurer, P. P. Harris.

—*Sioux City & Northern.*—A. K. Shurtliff has been appointed Chief Engineer of this company, with headquarters at Sioux City, Ia., and will have charge of the maintenance of track, bridges and buildings.

—*Southern Coal, Iron & Railroad Co.*—At a meeting recently held, the following officers were elected: President, Hon. Charles Grant, Jr.; First Vice-President and Chief Engineer, L. C. Wolkens; Second Vice-President, H. A. Armstrong; Treasurer, Wm. C. Colcord; Secretary, Charles E. Willard; Clerk, S. A. Lenczkey. The offices of the company are now at 74 Tremont street, Boston, but will shortly be moved to 620 Atlantic avenue, Boston. Offices will also be established in New York City and at Morristown, Tenn.

—*Southern Pacific.*—Mr. J. C. Stubbs has been elected Fourth Vice-President, with general charge of the traffic on all the lines included in the system.

—*Southern Pacific (Atlantic System).*—C. C. Wallard has been appointed Assistant Superintendent of Bridges and Buildings, with headquarters at Algiers, La., to fill the vacancy caused by the resignation of W. A. Lutes.

—*Tacoma & Chehalis Valley.*—George H. Ellsbury, James W. Stuart, George W. Stoerffer, Frank H. Miller and D. B. Rees are the directors of this Washington company.

—*Tavares Orlando & Atlantic.*—G. H. Hepburn has resigned as Assistant General Freight and Passenger Agent of the Tavares Orlando & Atlantic road, and the traffic departments of that line and of the Tavares Apopka & Gulf have been consolidated. R. B. Foss has been appointed Assistant General Freight and Passenger Agent of the two roads, with headquarters at Orlando, Fla.

—*Texas Western.*—John H. Gray has been appointed General Manager of this road, which has been taken out of the hands of the Receiver.

—*Union Pacific.*—G. M. Cumming, General Manager of the Mountain Division, with headquarters at Salt Lake, has resigned, and C. F. Ressique has been promoted to the position.

—*Virginia Midland.*—At the annual meeting of the stockholders of the company held at Alexandria, Va., Dec. 18, the following officers were elected: President, T. M. Logan; Secretary, W. H. Marbury; Assistant Secretary, A. J. Rauh; Directors, George Parsons, John H. Inman, J. C. Maben, John McAnarney, New York; E. E. Meredith, Brentsville, Prince William County, Va.; R. F. Mason, Charlottesville, Va.; Joseph Wilmer, Rapidan, Culpepper County, Va.; the Hon. John S. Barbour, John W. Burke, Alexandria, Va.; Alexander D. Payne, Warrenton, Va.; Charles M. Blackford, Lynchburg, Va.; C. G. Holland, Danville, Va.; Claude A. Swanson, Danville, Va.; J. T. Lovell, Front Royal, Va.; James B. Pace and E. D. Christian, Richmond, Va.

—*Winona & Southwestern.*—E. J. Hornbrook has been appointed General Freight Agent of this road, with office at Winona, Minn.

OLD AND NEW ROADS.

—*Arkansas Midland.*—The road is to be relaid with 50-lb. steel rails between Helena and Clarendon, 50 miles. One thousand tons have been delivered, and these will be put down between Barton and Holly Grove. Another 1,200 tons have been shipped.

—*Atchison, Topeka & Santa Fe.*—The board of directors officially report that the deposits of bonds under the reorganization plan aggregate in Europe \$30,313,700, and in America, \$8,517,000, or in all \$32,830,700, and also that a decisive majority of each and every one of the 36 issues of bonds of the Atchison System has been so deposited and, therefore, all rights of holders to make deposits of bonds have virtually ceased; but the chairman has been authorized to receive in his discretion, bonds for deposit under the plan up to Dec. 31, under the conditions heretofore announced.

—*Atlantic, Atlanta & Great Western.*—Preliminary surveys on this line were completed some time ago, but several sections of the line are now being surveyed again. One party of engineers is running a line from the Ocmulgee River east through Monticello to Eatonton, where it connects with the old survey which went south of Monticello. W. C. Prahs, of Atlanta, is Chief Engineer.

—*Baltimore & Ohio.*—The following is the statement of the earnings and expenses for November, 1889 (approximated), compared with November, 1888: Earnings, 1888, \$1,590,985; 1889, \$1,952,121, an increase of \$352,156. Expenses, 1888, \$1,214,552, and 1889, \$1,334,062, an increase of \$119,510. Net, 1888, \$385,413, and 1889, \$618,059; an increase of \$232,046. Earnings and expenses for the two months of the fiscal year 1889-90, as compared with the same months of the fiscal year 1888-9 were

(November, 1889, approximated): Earnings, 1888, \$3,453,500, and 1889, \$4,303,711, an increase of \$705,205. Expenses, 1888, \$2,404,080, and 1889, \$2,671,279, an increase of \$267,199. Net, 1888, \$1,049,426, and 1889, \$1,532,432, an increase of \$483,006.

The company has purchased ground, and will establish large freight yards at Berlin, Md., 70 miles west of Baltimore and west of the junction with the Metropolitan branch. When east-bound freight is too heavy to admit of prompt and convenient handling at Baltimore and other eastern termini, the cars will be held at Berlin.

Brierfield, Blockton & Birmingham.—Grading has been completed from Montevallo to Lacey's, in the Cahaba Valley, and tracklaying will be finished to that point in a few days. From Lacey's one branch extends north to Birmingham, and another southwest to Blockton, Ala. Little work has yet been done between Lacey's and Blockton, and grading has been delayed by very heavy work.

Brockville, Westport & Sault Ste. Marie.—The contract for the extension of this road from Westport, Ont., to Palma Rapids, on the Madawaska, 80 miles, will be let in a few weeks. The route has been surveyed and the plans deposited at Ottawa. The road will cross the Canadian Pacific near Sharbot Lake. The company has asked the Canada Atlantic to extend its line westward to near Westport, Ont., to connect with this road. The reports of contemplated leases with the Grand Trunk and Canadian Pacific are denied, though a lease to either would be desirable.

Canadian Pacific.—This company will apply to the Dominion Parliament for acts empowering it to lease the South Ontario Pacific road, and authorizes the issue of additional consolidated debenture stock to purchase ocean steamships under the powers previously conferred upon the company.

It is stated that this road will build a branch from a point near Shelburne, on the Toronto, Grey & Bruce division, to Collingwood, Ont., to give a better outlet for business between Georgian Bay and the East.

The Dominion government is again pressing the company to make immediate selection of its unappropriated lands in the northwest, amounting to some 7,000,000 acres. The company contends that it is doing its utmost to finally close up its land grant selection.

Cape Girardeau Southwestern.—A survey is being made by the engineers of this company from Cape Girardeau southwest to Sikeston, on the St. Louis, Iron Mountain & Southern, about 30 miles.

Chesapeake & Ohio.—A branch of this road is under consideration from Clifton Forge, Va., where it connects with the Richmond & Danville, north to the Warm and Hot Springs in Bath County, Va., a distance of about 22 miles.

Chicago & West Michigan.—This company has under contract an extension from Baldwin north to Traverse City, Mich. Preliminary surveys have been recently made to continue this line from Traverse City on the west arm of the Grand Traverse Bay, northeast about 15 miles, to Elk Rapids, on the east arm of the bay. The company has not yet decided whether anything further will be done.

Clarion River.—This company has been incorporated in Pennsylvania to build a road from the village of Halton, in Elk County, to a point on the Ridgway & Clearfield road, near the mouth of Laurel Run. The length of the road is 12 miles. The capital stock is \$120,000. W. H. Hyde, Ridgway, Pa., is President.

Columbia & Port Deposit.—The proceedings begun last July by the Pennsylvania, have been continued by a decree of the Common Pleas Court ordering the foreclosure of the Columbia & Port Deposit. The company has a funded debt of \$1,882,000 7 per cent. bonds, which are all held by the Pennsylvania except \$60,000. No interest has been paid on these bonds for some years. The road extends from Columbia, Pa., to Port Deposit, Md., 40 miles, with a short branch from Perryville to Port Deposit.

Columbus & Cincinnati Midland.—A meeting of stockholders will be held in Columbus, O., Jan. 3, for the purpose of taking action upon the following matters: Leasing the road to the Central Ohio; increasing the capital stock by issuing \$1,000,000 preferred stock; extending the present mortgage of the company 25 years from its expiration or making a new mortgage to effect the extension.

Concord & Montreal.—The Suncook Valley extension of this road, which has just been completed between Pittsfield and Alton Bay, N. H., 12 miles, has been leased to this company at an annual rental of five per cent.

Des Moines Valley.—The Secretary of the Interior has rendered a decision in the case of S. M. Fairchild against this company. The lands involved in this case were claimed by the railroad company by reason of the certification of the State, as indemnity lands. The Secretary, however, holds this certification to have been erroneously made, and directs that a demand for relinquishment or reconveyance of the lands to the United States be made upon the company, in default of which suit be recommended to set aside the certification.

Drummondville & Richmond.—The company proposes to ask for a Dominion and Provincial subsidy for the construction of a line from Drummondville, Que., via L'Avenir and Ulverton, to Richmond. The road is already constructed as far as L'Avenir, and about 14 miles remain to complete it to Richmond. At Drummondville connection will be made with the Drummond County road, and at Richmond with the Grand Trunk, and the Missisquoi & Black River road, which is now being built. The portion of the line from Drummondville to L'Avenir is owned by the Canadian Pacific.

Duluth, Crookston & Northern.—The Northern Pacific has acquired possession of this line, and has commenced operating it as a part of the Duluth & Manitoba road, between Fertile and Crookston, Minn., a distance of 22 miles. Holmes and Maren are the intermediate stations.

Eastern.—At a special meeting of stockholders last week they voted to ratify the action of the directors in assuming the lease of the Northern Railroad, originally made to the Boston & Lowell.

Fairhaven & Southern.—A large number of men are still at work on the northern end of this line, and grading is making much progress. Three forces are now employed, one between New Westminster and the British boundary, a second between Fairhaven and Blaine, and a third south of the Skagit River, on the line of the

Stillaguamish River. Tracklaying and bridge building is in progress on some portions of the line.

Fort Worth & Albuquerque.—The engineers of this road have been engaged for several weeks running preliminary surveys from Fort Worth northwest to Springtown, in Parker County. These have been finished and the estimates and profiles are now being made. Stephen D. Temple, of Fort Worth, is Chief Engineer.

Franklin & Tilton.—The money for the stock and bonds which will be issued to build this road, referred to last week, will be furnished equally by the Northern and by the Boston, Concord & Montreal road or their successors, the Boston & Maine and the Concord & Montreal. The new line is not fully located as yet, but it is expected that this will be done in the course of a few weeks, and then building will be commenced, as the charter provides that the road must be substantially completed by Sept. 1, 1890. It will be four or five miles long, according to the route finally selected. The road will connect the Northern at Franklin with the Boston, Concord & Montreal at Tilton, N. H. George E. Tood, of Concord, is Superintendent.

French Broad Valley.—The contracts for grading on this road are to be let in sections of 10 miles, and the first 30 miles will probably be awarded in three weeks. The contracts for tracklaying will be let as the work proceeds. The grading is very light; the maximum grade is 30 ft. per mile and the maximum curvature six degrees. The company has been voted liberal subscriptions along the route, including \$100,000 in county bonds. The road is to extend from Asheville, N. C., along the French Broad Valley to the head of the river, 60 miles. H. M. Ramseur, of Asheville, is Chief Engineer.

Georgia Southern & Florida.—Trains are now running from Lake City south, 21 miles, to Lake Butler, Fla. The grading and tracklaying have nearly been completed to Palatka, and the line will soon be opened to that point.

Grand Tower & Cape Girardeau.—The road has been opened for freight service, and passenger trains will probably be put on in two weeks between East Cape Girardeau and Grand Tower, Ill., 25 miles. The company has executed a mortgage on its property for \$350,000.

Grand Trunk.—The County of Halton, Ont., is suing the company to recover \$65,000, the amount of the bonus granted by the plaintiffs to the Hamilton & Northwestern at the time of its construction. It is claimed that the recent amalgamation of the line with the Grand Trunk was a breach of a condition, made when the bonus was voted, that the road be operated as an independent line for 21 years, and that the company has forfeited its right to the bonus.

Hampton & Branchville.—This company has been chartered in South Carolina to build a road from Hampton, S. C., toward Branchville for 35 miles.

Hawkinsville & Florida Southern.—J. D. Stetson, C. V. Gress and others have chartered a company of this name in Florida.

Illinois Central.—The following is the report of the company for the five months ending Nov. 30, 1889 and 1888 (November, 1889, estimated):

Miles.	1889.	1888.	Inc.
2,275	1,953	322	
Gross earnings.	\$6,368,537	\$5,201,027	\$1,167,510
Oper. exp. and taxes.	3,685,237	3,276,134	409,123
Perm. imp. paid from income.	146,290	131,487	11,763
Total.	\$3,831,507	\$3,410,621	\$420,886
Net earnings.	2,537,030	1,790,406	746,624

Intercolonial.—The Dominion government is being urged to extend this road from Point Levys, opposite Quebec, to Montreal. This line would be 39 hours shorter than the present St. Lawrence route and 10 hours shorter than the Canadian Pacific. The extension would absorb the road between Montreal and Sorel, and also the partially completed line from Sorel to Point Levys. The government is also being urged to build a branch from a point near Lake Metapedia to Gaspe basin, 110 miles, and to build a harbor at Gaspe.

Interoceanic.—In our issue of Nov. 29 we gave an account of the progress of construction on this road. The following additional statement from an officer of the company shows more in detail the route of the main line and branches of the road, and their lengths. The road is projected to extend from Acapulco on the Pacific Ocean to Vera Cruz on the Atlantic, passing through the cities of Chilpancingo, Tixtla, Chietla, Izucar de Matamoros, Atlitico, Cholula, Pueblo, San Marcos (a station on the Mexican Railroad), Vireyes (an Hacienda), Perote and Jalapa. The total distance is 512 miles, of which 152 is already constructed and 109 in operation.

From Pueblo the line runs up to the City of Mexico through San Martin Texmelucan, Culapalpam, Irolo and Texcoco, a distance of 130 miles, all of which is in operation. From the City of Mexico it runs down by Cuautla Morelos to Yautepec, Tlaltizapan, Jojutla and Amacuzac. The distance is 143 miles, of which 117 miles is already constructed, and 114 in operation from Mexico to Tlaltizapan. The principal branches are from Antigua to Huatusco, 47 miles; from Vireyes to San Juan de los Llanos seven miles, to be continued to Tlaltizapan and Teziutlan, 40 miles; from San Lorenzo to San Nicolas, 14 miles, to be continued to "La Luz" and Soltepec on the Mexican Railroad, six miles; from Soapayuca to Pachuca, 34 miles; from Chietla to Cuautla Morelos, 42 miles, and from Yautepec to Cuernavaca, 17 miles. The total length of the main line is 784 miles and of branches 200, making a total amount of 980 miles. Of the main lines 400 miles has been constructed, of which 352 is in operation. There is 28 miles of branches constructed, of which 21 is in operation. The gauge of the road is three feet, and 40.3 lb. steel rails are used. There are 34 engines, 41 passenger cars and 300 freight cars in service.

The Interoceanic Railway Co., Acapulco to Vera Cruz, Limited, of London, purchased all the concessions granted by the Mexican Government to Señor Delfin Sanchez, who contracted to construct all the lines. The company must finish the lines within 12 years from July 1, 1887. A. L. Alexander is Resident Engineer of the company in the City of Mexico. James Livesey & Sons, London, are Consulting Engineers. The chief office of the company is at Dashwood House, 9 New Broad street, London. Delfin Sanchez is Director General of the construction company. F. Gilham, C. E., is Representative in London and Mexico, and E. B. Forbes is Chief Engineer in the City of Mexico. The general offices of the construction company are at 14 Calle de San Agustin, City of Mexico. The offices in London are at Winchester House, Old Broad street.

Kansas City, Bentonville & Southern.—Articles of incorporation have been filed in Arkansas by this company, with a capital stock of \$1,550,000. The road will be 120 miles in length, beginning at a point on the state line dividing Arkansas and Missouri, near Sugar Creek, thence to Bentonville, Ark. The directors are A. W. Dinsmore, T. B. Gilmore, James A. Rice, C. M. Robinson and L. H. McGill.

Kansas City, Nevada & Fort Smith.—The survey for this road was begun at Nevada, Mo., this week. A line is to be run northwest to Amoreet in Bates County and another southwest to the south line of Vernon County.

Kansas City & St. Joseph.—The survey is now being made for this road between Kansas City and St. Joseph, Mo. It is expected to have the location of the line completed by Jan. 1. G. W. Peterson, of Kansas City, is Chief Engineer.

Kansas City, Wyandotte & Northwestern.—The first train on the Kansas City & Beatrice division was run Dec. 5, and through trains are now running regularly on this line from Beatrice, Neb., to Kansas City, Mo.

Kearney, Hutchinson & Gulf.—This company has been chartered in Nebraska to build a road from Kearney, Neb., south toward Galveston, Tex., through the counties of Kearney, Buffalo and Franklin in Nebraska, and Smith, Osborne, Mitchell, Lincoln, Ellsworth, Rice, Reno, Kingman and Harper in Kansas. The capital stock is \$3,000,000.

Lawrenceville & L'Avenir.—This company is making application to the Legislature of Quebec for a charter for a road from Lawrenceville, Stafford County, through Valcourt, Bethel, to L'Avenir, P. Q.

Lower Laurentian.—C. A. Scott, of Quebec, has contracted to build the remaining portion of this road, and a surveying party has been sent out to locate the eastern end of the line. The road is expected to be completed as far as River à Pierre on the Lake St. John line by next summer.

Mahoning Coal.—A meeting of the stockholders will be held at Cleveland, Jan. 8, to consider an increase in the capital stock by the issue of \$400,000 preferred stock, to be used in purchasing the Mahoning & Shenango Valley, the Shenango Valley and the Stewart roads, which are now small branches of the Lake Shore & Michigan Southern, extending from the Mahoning Coal road to Sharpsville and Sharon, Pa. These branches, when purchased by the Mahoning coal road, will be leased to the Lake Shore & Michigan Southern.

Memphis, Little Rock & Indian Territory.—This company, which became bankrupt last summer, before even the surveys had been completed, has been newly chartered in Arkansas by practically the same incorporators, and with the capital stock increased from \$6,000,000 to \$8,000,000. The charter describes the road to extend from Argenta, opposite Little Rock, through Pulaski County and the state of Arkansas to a point on the state line between the state of Arkansas and the Indian Territory.

Missouri Pacific.—Nearly 1,000 men are reported at work on the Fort Scott, Wichita & Western, between Fort Scott, Kan., and Rich Hill, Mo. This section of the line is expected to be completed within 60 days. The route east from Rich Hill passes through Appleton City and Deep Water, and thence northeast to Tifton, on the main line of the Missouri Pacific.

New Brunswick.—The directors propose to consolidate the indebtedness of the company and to issue consolidated debenture stock for that and other purposes of the company.

New Roads.—Thomas J. B. Rhoads, of Boyertown, Pa., and others are securing right of way for a proposed road from Phoenixville north through Boyertown to Allentown, which they hope to induce the Pennsylvania to build.

A company is being organized to build a road from Port Burwell, Ont., on Lake Erie, through Tilsonburg, to a point on the Canadian Pacific, near Woodstock or Ingersoll, in Oxford County.

It is reported that John F. Granville and Henry Gamble, of East Saginaw, Mich., have the contract for building 90 miles of a road from Orange C. H., W. Va., to Keysville, Va., with a ten-mile branch to Buckingham C. H. It is also stated that an issue of \$1,500,000 first mortgage bonds has been placed in New York. Thomas Moore, of Elizabeth, N. J., is Chief Engineer, and John Goodwin, of Baltimore, is also interested.

Work is reported in progress on a road to extend from Eldorado Springs, Mo., to Walkers, a distance of about 13 miles.

New York Central & Hudson River.—The statement of the earnings and operating expenses of the company and its leased lines, for the quarter ending Dec. 31, is as follows, the figures for this year being partly estimated.

	1889.	1888.	Inc.
Gross earnings.	\$9,649,722	\$9,170,889	\$478,833
Oper. exp.	6,218,585	5,971,940	246,945
P. C. exp. to earn.	64,441	65,111
Net earnings.	\$3,431,137	\$3,199,249	\$231,888
Fixed charges.	1,935,420	1,963,260	2,160
Profit.	\$1,465,717	\$1,235,989	\$229,728
Dividend.	894,283	894,283
Surplus.
	\$571,434	\$341,706	\$229,728

Norfolk & Western.—On the Clinch Valley Division the track has been laid for a distance of about 52 miles. The completion of this division is being considerably delayed on account of wet weather, and on account of serious slides that have occurred in the road bed. The company now expects to complete about 80 miles of track by April 1, and to have the line completed by the middle of May. The contract has been recently let to build 16 miles on the North Carolina Extension from Ivanhoe, Va., south in the direction of Mt. Airy, N. C. Eight miles of this is along New River and the other eight miles is on Chestnut Creek. The location for the proposed Ohio extension extending from the present end of track at Elkhorn, on the Flat Top extension, to Ironton, Ohio, a distance of about 195 miles, is now fully completed.

Northern Pacific & Manitoba.—Track on the Moris-Brandon branch of this road has been laid three miles beyond Wawa-Nessa, near Souris City, and within 20 miles of Brandon, Man. Bridging and surfacing have been completed and tracklaying will not be retarded by these matters. It is intended to finish the line to Brandon by Jan. 1.

Oregon Improvement Co.—This company recently filed a mortgage for \$15,000,000 on all its property in Oregon, Washington and California, to the Farmers' Loan & Trust Co., of New York. It is stated that the funds received will be expended as follows: \$4,500,000 to pay the consolidated debts of the company; about \$1,500,000 to complete the Seattle & Northern road from Anacortes on Fidalgo Island, across the narrow Swinomish Slough, to the company's coal lands in Skagit County. The remaining \$9,000,000 will be applied to the improvement and extension of the Columbia & Puget Sound road. The latter is now a narrow gauge line from Seattle to the Newcastle coal mines. The gauge will be widened to standard, and the road will be extended through the Cascade Mountains by way of the Natchez Pass and along the Natchez River in a southeasterly direction to North Yakima. The company is as yet undecided as to the route beyond North Yakima. Two routes are said to be under consideration, one paralleling the Northern Pacific to Pasco and to a connection with the Union Pacific system at Wallula, and the other crossing the Yakima River and thence in a more direct course to a connection with the Oregon Railway & Navigation Co.'s line on the Columbia River. It is also proposed to spend \$500,000 in the construction of two steamships for the Pacific Coast Steamship Co., which is controlled by the Oregon Improvement Co.

Oregon Railway & Navigation Co.—The company has awarded the contract for building the branch across the Grande Ronde valley from La Grande to Elgin, Ore., 20 miles, to Andonelle & Doe.

Ottawa & Gatineau—A number of the men and teams employed by the subcontractors on this road have left their work, some of the subcontractors being unable to meet their obligations. The head contractor has, however, declared that he will become responsible for the wages of men employed.

Pacific.—The charter of this company has been filed in Colorado. The company proposes to build a line from Santa Cruz north along the coast through Spanish Town towards San Francisco for a distance of about 100 miles. S. Haslett, of San Francisco, is President, and H. Craig is Treasurer.

Pacific Short Line.—The contract for grading and bridging the second division of 45 miles of the Nebraska & Western, from Plainview to O'Neill, Neb., has been let to E. P. Reynolds & Co., who built the line from Sioux City west to Plainview. The contract will be submitted immediately, and grading will continue until the ground becomes frozen. Tracklaying is in progress from Sioux City west.

Pennsylvania.—This company is about to construct a line between Downingtown and Morrisville, Pa., opposite Trenton, N. J., a distance of about 51 miles, for the passage of the freight trains between these points, thus avoiding the accumulation of cars in the Philadelphia yards. The portion of this line in Chester and Montgomery counties will be built under the charter of the Pennsylvania and known as the "Trenton Branch." Through Bucks County, a distance of 15 miles, it became necessary to take out a charter for the new road, called the "Trenton Cut-off," whose incorporation was referred to last week.

Philadelphia & Reading.—The amount asked by this company before it would begin construction on the extension of the Northeast Pennsylvania from Hartsville to New Hope, Pa., on the Delaware River, has been raised, and it is expected that the company will commence construction in a short time.

Quebec & Lake Temiscamingue.—This road is projected from Quebec to Lake Temiscamingue. It will start from some point on the Quebec & Lake St. John road, north of St. Raymond, cross the river St. Maurice below the Tugue, and run thence direct to Lake Temiscamingue, about 350 miles. The line will follow the upper bend of the Ottawa River for 150 miles. At Lake Temiscamingue it will open up a large agricultural district.

Rome & Decatur.—J. B. Newcomb & Co., of New York, purchased this road for \$832,000 at the sale in New York Dec. 18. The company was organized in 1886 to build from Rome, Ga., to Decatur, Ala., a distance of 135 miles. Contracts were let for the construction of the line to Attala, 61 miles, but in 1887 the road became embarrassed and a Receiver was appointed before the work had been completed. R. T. Dorsey, of Atlanta, Ga., was made Receiver, and he issued receiver's certificates for \$400,000, bearing seven per cent. interest, for the completion of the road to Attala. Eugene Kelly is President of the company.

St. Catharines & Niagara Central.—This company will apply to the Canadian Parliament for power to extend its Hamilton branch line through the city of Hamilton, in Halton County, and also to exchange the bonds of the company held by the city of St. Catharines, Ont.

St. Joseph Valley.—Grading on the extension of this road toward Benton Harbor, Mich., has been suspended for the present. It is understood that further contracts for grading will be let during the winter and construction commenced again early in the spring. Ten miles of the road is in operation, from Buchanan to Berrien Springs, Mich., and six miles more has been graded. The surveys have all been made from South Bend to Benton Harbor, on Lake Michigan. F. McOmber, of Berrien Springs, is General Manager.

St. Louis, Arkansas & Texas.—The Receivers have asked the United States District Court to authorize them to build a line from Sherman to Denison, a distance of about 10 miles, or to construct a line to the Red River toward Ardmore, I. T., a distance of about 25 miles.

St. Louis & Belleville.—Articles of incorporation of the company have been filed in Illinois to construct a line of road from Belleville, Ill., to St. Louis, Mo. The capital stock is \$300,000. The principal office is at Belleville. The incorporators are D. P. Alexander and J. D. Alexander, Wichita, Kan.; George Knobeloch, C. T. Alexander & F. Holder, Belleville, Ill.

St. Louis & Eastern.—The charter of this company has been filed in Illinois. It is proposed to construct a road from a point opposite the city of St. Louis in Madison County to a point on the Illinois State Line in Crawford County. The capital stock is \$200,000, and the principal business office is at East St. Louis.

San Antonio & Arkansas Pass.—Tracklaying on the extension from West Point north has been completed beyond Giddings to within a few miles of Lexington, and will probably reach Rockdale by Jan 1. Grading is practically completed through Rockdale and Cameron to

Waco, and tracklaying is also in progress from the latter point south. J. P. Nelson is Chief of Construction.

Saratoga & St. Lawrence.—This line has been completed from Bombay, N. Y., where it connects with the United States & Canada (operated by the Grand Trunk), to Moira, N. Y., on the Northern Adirondack and Central Vermont roads. It forms the shortest line between Montreal and Saratoga through the Adirondacks. Regular trains will begin running within the next few days.

Seattle, Lake Shore & Eastern.—This company has just let a contract to Earle & MacLeod, of Seattle, for grading the 15 miles of road lying north of Snohomish Junction, and south of the Skagit River. Smith & Burnham have been awarded the contract for grading the northern 25 miles of the line. About 20 miles of this branch is now in operation. From the International Boundary, where the line will connect with the Canadian Pacific, some 15 miles has been cleared, and five miles is now being graded. The work consists of exceedingly heavy clearing and grubbing, timber from 12 to 14 ft. in diameter not being unusual; the grading, while not light, is only heavy on occasional sections. There is a great deal of bridging, mostly pile and trestle structures and, probably, three or four truss bridges. The maximum grade is 1½ per cent., and the maximum curvature is eight degrees. The present force on the work is light as the rainy season has begun, and the work has been so recently let, that a full force has not yet been placed upon it. The main line of the road is now operated from Seattle east 63 miles toward the Snoqualmie Pass, where extensive iron mines exist. There is also in operation 50 miles from Spokane Falls west. A reconnaissance has been made on the section from a point in the vicinity of Snohomish east across the Cascade range and Columbia River towards Spokane Falls, a distance of some 300 miles; but it requires a great deal of surveying before definite information can be obtained as to the route, alignment, and grades. There will probably be a tunnel some 2,000 ft. long at the summit of the Cascade mountains, and it is not supposed that a grade of less than two per cent. can be obtained in crossing the mountains. Nothing is at present being done on this portion of the line. F. W. D. Holbrook is Manager, and R. H. Talcott, Chief Engineer, with offices in the Boston Block, Seattle.

Seattle & Northern.—Several large contracts for ties and terminal buildings have been recently let, and it is rumored that the company will soon resume construction, and extend the road to the coal lands on the Skagit River. The distance is about 25 miles.

Tacoma & Chehalis Valley.—The company has been chartered in Washington to construct a standard gauge line from some point on Gray's Harbor, easterly along valleys of Chehalis and Cowlitz to the Columbia River, with branches to Tacoma and Seattle. The capital stock is \$300,000.

Tacoma & Puyallup.—The grading on this narrow-gauge line is in progress from both ends, and has now been completed for two miles southeast of Fern Hill, on the Tacoma end, and about two miles southwest on the Puyallup end. Six miles of rails have been shipped from Scranton, Pa., and another lot has been ordered in England. The locomotives are being made by H. K. Porter & Co., of Pittsburgh, and the Baldwin Locomotive Works.

Texarkana & Northern.—John P. Hughes, of Dallas, has been awarded the contract for building the section of this road from Red River north towards Fort Smith, Ark.

Texas Cattle Trail.—This company, organized last November in Albany, has filed its charter in Texas. The route is from Vernon, in Dallas, through the counties of Knox, Baylor, in Waco, Throckmorton, Shackelford, Jones, Taylor, Callahan, Runnels and Coleman to Brady, in Coleman County. The capital stock is \$500,000. The principal office is to be in Albany, Tex.

Tobique Valley.—Tracklaying was begun at Andover, N. B., Dec. 2, and 10 miles of the road will probably be completed by Jan. 1. The first 14 miles have been graded, and upon this section 21,000 cubic yards of solid rock and 120,000 cubic yards of earthwork were removed. C. Le B. Miles, of Andover, is Chief Engineer.

Vaudreuil & Prescott.—Work will be commenced on the Ottawa end of the road early next spring. The contract for grading from Ottawa to Clarence will be let first. The tracklaying from Vaudreuil is proceeding at the rate of a mile a day, and Rigaud will be reached by Jan. 1. The first train from Rigaud to Vaudreuil is expected to run the middle of next month.

Virginia Roads.—The following bills have been introduced into the state legislature: To incorporate the Pittsburgh & Knoxville; to build from the southern line of West Virginia, where it touches the counties of Buchanan or Tazewell, to the northern boundary of Tennessee; to authorize the Lynchburg & Durham to consolidate with any connecting line; to incorporate the Washington, Alexandria & Fairfax with a capital stock of \$1,000,000; to build a road from Alexandria to Falls Church, Va., F. K. Windsor and L. C. Burley are incorporators; to incorporate the Atlantic, Allegheny & Western; to build a road from some point in West Virginia to some point on the Potomac, York or Rappahannock rivers. Francis A. French and G. H. Sewers, of New York City, are incorporators.

Walhonding Valley.—This company has been incorporated at Columbus with a capital stock of \$100,000, to build a road to extend from Kimbolton to Mansfield. Gen. A. J. Warner is one of the incorporators.

Waukesha, Pewaukee, Oconomowoc & Western.—This company has filed articles of incorporation at Madison, Wis. The company proposes to construct a line from Waukesha to Oconomowoc, a distance of 22 miles, passing through various summer resorts in that section. The capital stock is \$100,000.

Weatherford, Mineral Wells & Northwestern.—It is stated that arrangements have recently been made to commence grading on this road, which is to extend from Weatherford northwest to Mineral Wells, Tex.

Wheeling Bridge & Terminal.—The company has filed a mortgage for \$1,000,000, made to the Washington Trust Co., of New York. It covers the property of the company in Belmont County, O., and in Marshall County and the city of Wheeling, W. Va. About 2,000 ft. of tunneling has been completed in Wheeling, and work is about to be commenced on a third tunnel, from Wheeling Creek Valley to Caldwell Run. The superstructure of the bridge over the Ohio is now being put in position.

White's Creek, Rockwood & Emory River.—This company has been incorporated in Tennessee by J. F. Tarwater and others to construct a line from some point on White Creek to a point on the Emory River.

TRAFFIC.

Traffic Notes.

Cincinnati merchants have formed an organization to secure equitable rates from railroads.

The Chicago, Milwaukee & St. Paul announces a reduction in the wheat rate from milling-in transit stations.

The new route from Pennsylvania to New England via Poughkeepsie Bridge is out with new tariffs materially reducing the locals previously in use.

California fares will be restored and kept steady if the recent conference of passenger agents has any weight. All lines interested were represented.

The threatened reduction in live stock rates by the Alton must involve rates on dressed beef also, and Western roads are not pleased at such a prospect.

The Illinois Board of Railway and Warehouse Commissioners is preparing an entirely new schedule of live stock rates and wishes suggestions from shippers.

Now that the auditors of all the principal traffic associations are agreed that through billing should prevail it may be expected that efforts will be made by special committees to that end.

The state of Georgia is not to have an easy time in collecting its tax on sleeping and drawing-room cars. Some roads will pay to avoid trouble, while others will fight it because the commerce is inter-state.

Excursion rates for any and all occasions are now the rule. Seven such events were thus honored by the Trans-Missouri Passenger Association at its last meeting. Holiday reductions are quoted quite generally.

The question whether the Union Pacific-Northwestern alliance is a violation of the agreement of the Interstate Railway Association was debated before that body, and finally referred, by resolution, to Chairman Walker.

President A. B. Stickney, of the Chicago, St. Paul & Kansas City road, has a comprehensive plan for a transfer clearing house at Chicago, receiving and delivering carloads and less from all roads. A combination of the two best roads now building is included in the plan.

The Interstate Commerce Commission has dismissed the case against the Michigan Central and Lake Shore roads, brought by Farmer White, because these roads took out five or 10 lbs. of wheat for loss in weighing and handling. As White did not say that the wheat was for interstate transportation, the Commission dismissed the case, without prejudice to any other action correctly brought.

The Joint Executive Committee of the Trunk Lines and Central Traffic Association has voted that the differential passenger rates in force on the weaker lines between the Atlantic seaboard and the Mississippi River may be applied to through tickets to and from Kansas City, Omaha, and all parts west of Joint Executive Committee territory. They have heretofore been confined to tickets sold at offices on or east of the Mississippi River.

The Western States Passenger Association was dissolved at a meeting of the General Managers in Chicago Dec. 18. This action was taken on account of the withdrawal from membership of the Chicago, Burlington & Northern and the Minneapolis & St. Louis. These roads absolutely refused to remain members unless the Wisconsin Central showed to the members its secret contracts on passenger business in accordance with the association agreement. This the Wisconsin Central refused to do. In addition to this, the Wisconsin Central absolutely refused to remain a member of the association unless it was allowed differential rate fares. This dissolution takes effect Dec. 31, provided the two lines not represented at the meeting agree to it. These are the Milwaukee, Lake Shore & Western, and the Sioux City & Pacific.

Buffalo Car Service Association.—The organization of the Buffalo Car Service Association was completed Dec. 18. The agreement was voted for by all the roads except the Grand Trunk and the Buffalo, Rochester & Pittsburg, whose representatives withheld their assent until their superiors had been consulted further. Division Superintendent Edward Van Etten, of the Rome, Watertown & Ogdensburg, formerly Superintendent of the Erie's Buffalo Division, was elected manager, at a salary of \$3,000 a year. The Association goes into effect on Feb. 1, 1890.

Passenger Rates on the Long Island.—Residents of towns on Long Island are taking steps to compel the Long Island Railroad to reduce passenger fares from three to two cents per mile, claiming that the growth of towns is retarded. The railroad says that family and excursion tickets are sold at two cents a mile now, but that the present trains cannot be run at that fare for all passengers.

East-bound Shipments.—The shipments of east-bound freight from Chicago by all lines for the week ending Saturday, Dec. 14, amounted to 101,826 tons, against 80,435 tons during the preceding week, an increase of 21,390 tons, and against 108,891 tons during the corresponding week of 1888, a decrease of 7,000 tons. The proportions carried by each road were:

	W'k to Dec. 14.		W'k to Dec. 7.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	14,082	13.8	9,998	12.4
Wabash	4,321	4.2	4,552	5.7
Lake Shore & Michigan South	17,359	17.1	15,101	18.8
Pitts., Ft. Wayne & Chicago	11,819	11.5	10,652	13.2
Chicago, St. Louis & Pitts.	11,561	11.4	8,778	10.9
Baltimore & Ohio	12,811	12.6	8,448	10.4
Chicago & Grand Trunk	13,181	13.0	11,026	13.8
New York, Chic. & St. Louis	8,652	8.5	6,190	7.8
Chicago & Atlantic	8,039	7.9	5,650	7.0
Total	101,825	100.0	80,425	100.0

Of the above shipments 7,672 tons were flour, 34,711 tons grain, 2,288 tons millstuffs, 7,023 tons cured meats, 6,110 tons lard, 8,677 tons dressed beef, 1,213 tons butter, 1,906 tons hides, 701 tons wool and 5,296 tons lumber. The three Vanderbilt lines together carried 39.4 per cent., while the two Pennsylvania lines carried 22.9 per cent.